

Multimodal Trip Planning Application (MMTPA) Test Report

for the Smart Columbus
Demonstration Program

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Produced by City of Columbus

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- Central Ohio Transit Authority
- Ohio Department of Transportation
- Mid-Ohio Regional Planning Commission
- The Ohio State University
- The Columbus Partnership
- Mobility Service Providers (Yellow Cab, Lime, Lyft, Bird, Uber)

Abstract

The purpose of this Multimodal Trip Planning Application Test Report is to document the results of the Pivot app testing conducted prior to launch. The primary goals of the testing were to evaluate how well the system conforms to the allocated test procedures and how well it provides the required functionalities. The evaluation included analysis, demonstration, inspection, and testing of various products, systems, and data to support final acceptance of the system and move forward to the next phase in the project, which is operations.

The Test Report contains a summary of test activities, identifies any issues and notable findings that occurred during testing, and documents the acceptance of functionalities.

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Chapter 1. Introduction

A Test Plan was previously developed by a multidisciplinary team composed of project stakeholders to formally test the functionality of the Multimodal Trip Planning Application (MMTPA) system.¹ This Test Report documents the results of the testing procedures introduced in the Test Plan that were used to validate the functionalities of the MMTPA system. This report summarizes test activities, identifies any issues that occurred during testing, and documents the acceptance of functionalities.

1.1. PROJECT BACKGROUND

The United States Department of Transportation's Smart City Challenge, launched in December 2015, was designed to encourage mid-sized cities to develop ideas for an integrated smart transportation system that would use data, applications, and technology to help people and goods move more quickly, cheaply, and efficiently. As part of the City of Columbus's response to the Smart City Challenge, Mayor Ginther and other City leaders focused in part on determining how an integrated smart transportation system would encourage use of multimodal trips, since citizens in urban areas increasingly view mobility as a service, and expect seamless connections as they move from mode to mode. Motivation for the Multimodal Trip Planning Application (MMTPA) project stemmed from this discussion. Additional considerations were gaps in the current system, such as lack of access to coordinated multimodal options, and lack of ability to compare prices across modes. The MMTPA project will provide these new functionalities and improve on existing functionality.

The MMTPA/CPS project was designed to allow travelers throughout Columbus and outlying communities to create multimodal trips and pay for services using a single, account-based system linked to different payment media and modes of transportation. Multimodal trip options include walking, public transit (COTA), ridesharing (Gohio Commute), bikesharing (CoGo), scooters (Bird, Lyme), ride-hailing (Yellow Cab, Uber, Lyft) as well as personal vehicle. Prior to the MMTPA/CPS project, Columbus residents and visitors did not have access to a single system that allows for the seamless planning and payment for multimodal trips.

For the CPS project, the COVID-19 pandemic exacerbated risks and challenges that the team was already working actively mitigate. This specifically included finalizing agreements with mobility providers for participation in CPS, and finalizing the terms of ownership with COTA, who had been identified as the end-owner for the solution. Development and Launch, originally planned for March 2020, had already been delayed to May due to these legal and business decision challenges from mobility providers. However, these negotiations stalled completely because of the pandemic. In addition, like most other transit agencies in the pandemic, COTA ridership dropped exponentially. Through the course of working with the City on the MMTPA/CPS project, COTA became aware of the challenges and limitations of COTA's fare collection system were at the forefront of conversations. These challenges, like many other risks, were also amplified by the pandemic and the increasing priority on enabling widespread adoption/use of contactless payment. Therefore, COTA changed its focus to enhancing its fare collection system and stepped away from ownership of the MMTPA/CPS project. In July 2020, the City recommended the CPS project be discontinued and MMTPA continue, and after coordination with USDOT, this request was approved in August 2020 and a subsequent grant reduction was negotiated.

¹ <https://smartcolumbusprogram.sharepoint.com/TaskBMMTPAANDCPSDeliverables/SCC-B-MMTPA-UAT-FINAL.pdf>

The MMTPA project, without CPS integration, makes multimodal travel options easily accessible by providing a robust set of transportation and payment options. The Pivot app allows travelers to request and view multiple trip itineraries from within a single app, and book and pay for services through deep linking with various mobility Provider apps. Users can compare travel options across modes, and plan and pay for their travel based upon current traffic conditions and availability of services.

In establishing the MMTPA/CPS project, Columbus sought to become a facilitator for Mobility as a Service (MaaS) by providing a platform that integrates end-to-end trip planning, booking, electronic ticketing, and payment services across all modes of transportation, public or private. The desired outcome was to make its communities work more effectively and to improve access to transportation options for communities in need of travel options to jobs and job centers in the region.

1.2. PROJECT OBJECTIVES

The three main goals for the MMTPA with respect to positive societal outcomes, which tie back to the original intent of the Smart City Challenge, are:

1. Enhanced mobility
2. Enhanced access to opportunities and service
3. Increased customer satisfaction

1.3. SYSTEM CONCEPT

The MMPTA is a complete multimodal trip planning solution for travelers in the Columbus region. Travelers download and install the MMTPA (Pivot app) from Android and iOS app stores. Travelers also interact with the Pivot app on kiosks and through a web portal.

The MMTPA is integrated with mobility providers through application programming interfaces (APIs).

1.4. TEST PROCEDURES

Test procedures are critically important to the acceptance of the system and are provided to test the system's ability to meet the requirements holistically, end-to-end, from all active participant viewpoints (test groups). Scenarios are made up of a series of test cases used to simulate the system in a real-world operational environment. This approach validates the system's ability to meet the concepts established through the MMTPA ConOps and provides a decision gate for the production release of the Pivot app.

1.5. REFERENCES

The MMTPA is designed to meet the user needs and requirements specified in the Professional Services Contract Between the City of Columbus and MTECH Solutions, LLC. This Test Plan has been developed based on the Institute of Electrical and Electronics Engineers (IEEE) 829 Test Plan Outline and is informed by other systems engineering documents for the Smart Columbus program listed in **Table 1**.

Table 1: References

Title	Pub. Date
IEEE 829 Test Plan Outline https://standards.ieee.org/standard/829-2008.html	July 18, 2008

Title	Pub. Date
Multimodal Trip Planning Application/Common Payment System (MMTPA/CPS) Concept of Operations for the Smart Columbus Demonstration Program https://d3hzplpmmz6qe4.cloudfront.net/2019-07/Multi-Modal%20Trip%20Planning%20System%20Concept%20of%20Operations.pdf	August 08, 2018
Common Payment System (CPS) System Requirements for the Smart Columbus Demonstration Program https://d3hzplpmmz6qe4.cloudfront.net/2019-07/Common%20Payment%20System%20System%20Requirements.pdf	December 19, 2018
System Architecture and Standards Plan for the Smart Columbus Demonstration Program https://d2rfd3nxvhnf29.cloudfront.net/2020-02/SCC-B-SASP-UPDATED_2-25-2020.pdf	February 25, 2020
Demonstration Site Map and Installation Schedule for the Smart Columbus Demonstration Program https://d2rfd3nxvhnf29.cloudfront.net/2020-01/SCC-B-DSP-IS-FINAL-20200124.pdf	January 24, 2020
Performance Measurement Plan for the Smart Columbus Demonstration Program https://d2rfd3nxvhnf29.cloudfront.net/2019-08/Smart%20Columbus%20Performance%20Measurement%20Plan.pdf	June 1, 2019
Safety Management Plan for the Smart Columbus Demonstration Program https://d2rfd3nxvhnf29.cloudfront.net/2019-06/SCC-F-Safety%20Management%20Plan_2019_05_21_City_Submission%20EDITED_CLEAN.pdf	December 5, 2019
MTECH Solutions Project Management Plan (private)	November 14, 2018
MTECH Safety and Security Plan (private)	July 30, 2019
Pivot Manual and Training Guide (private)	August 19, 2019
Pivot Communications Plan (private)	October, 2020

Source: City of Columbus

More information on the Smart Columbus Demonstration Program is on the Smart Columbus website.² This Test Report was adopted from the Institute of Electrical and Electronics Engineers (IEEE) 829-2008 Standard for Software and System Test Documentation.

² <https://smart.columbus.gov/>

Chapter 2. Test Status and Criteria

Each test case consists of several unique properties which should be considered holistically during the testing evaluation process. Properties include but are not limited to: test identifier (ID), test objective, procedure, and status. The following test statuses are used for each test case:

1. **Planned** – the test case has been defined, roles identified, testers assigned, and is ready for testing.
2. **In Progress** – the test case is underway but has not been completed.
3. **Passed** – a pass value indicates tests have completed the defined number of runs by various testers without error and the expected result has been achieved. It is expected that each time this test is performed, independent of who is testing, the same successful results will be achieved. There may be instances when a tester identifies a defect during the procedure, yet the test case still achieves the stated outcome. The case can still pass, but the testers must log the defect and bring it to the attention of the test manager. This can happen when there are minor bugs detected not critical to the essential functionality of the feature being tested such as an image being out of alignment or a misspelling.
4. **Failed** – a test case is marked as failed when the case does not meet part or all of its expected outcome. For all failed test cases, one or more defects must be logged to capture the details surrounding the failure and to track its status.
5. **Deferred** – a test case is marked as deferred when the case is unable to be performed at the current time of testing or when there is a change in requirements. Most often this will occur when a software product is being released in increments and the functionality is not ready when it's time to test the current release. If a test is deferred, the tester should provide a brief reason in the comments column to explain. The test manager is responsible for tracking deferred cases and evaluating the most appropriate time and/or response for addressing the case.
6. **Canceled** – a test case is marked canceled when the requirement affiliated with the test case is no longer applicable to the project.

More information on the tester roles and responsibilities for the MMTPA can be found in the MMTPA User Acceptance Testing Test Plan.³

³ <https://smartcolumbusprogram.sharepoint.com/TaskBMMTPAANDCPSDeliverables/SCC-B-MMTPA-UAT-FINAL.pdf>

Chapter 3. Test Results

This section presents results for each of the tests performed, along with a defect management log and change request (CR) log. Test plan development began in July 2019 and was completed on October 11, 2019. The dates for each phase of testing are included in this section. Throughout the testing procedures, issues, comments, and solutions were recorded through a series of web-based documents. This format allowed issues to be shared and addressed on an ongoing basis by all personnel involved in testing, including the Smart Columbus Team, MORPC, and other stakeholders.

The tables below provide test results for various test activities conducted throughout.

- Pivot App Test Results (**Section 3.1, Table 2**)
- Pivot Kiosk Test Results (**Section 3.2, Table 3**)
- Pivot Web Portal Test Results (**Section 3.3, Table 4**)
- Pivot API Load Testing Test Results (**Appendix A, Table 20**)

The test cases listed in this section focus on testing the system functional requirements. This section identifies the test results for each test case. All functions were tested under leadership of the system owner, test manager, and deputy test manager, who tests each test case from the perspective of the user. Throughout this process, any detected bugs, inconsistencies, errors, or the like were captured in the defect management tool and reported to the development team. The development team modified, updated, and enhanced the software to address issues that arose during testing.

3.1. PIVOT APP TEST RESULTS

Table 2 provides a results matrix of the results of testing the Pivot app. For each test case, test status is logged either as passed, failed, cancelled or deferred. All the test cases marked as deferred, failed or cancelled are tracked by defect management tool shown in **Table 5**. Relevant notes from the testers are included in the Test Comments column with references to defects or change requests in **Chapter 5**. Test cases that were regression tested or deferred to a different date will have multiple entries in Date Run and Test Status column.

Table 2: Pivot App Test Results Matrix

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRA001-V01	To successfully search for and install Pivot on iOS and Android devices.	Installation	The Pivot app is available in app stores and can be downloaded and installed on both Android and iOS devices.	<p><u>Pre-condition:</u> Tester has access to the app store for iOS and/or Android.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Access app store for the available device type (iOS or Android). 2. Search for the app using keywords "Columbus" and "Pivot". 3. Initiate the install process. <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: App appears in search results; app installs onto tester's device; app icon appears on phone.</p> <p><u>Post-condition:</u> Pivot is installed and has not been opened.</p>	Traveler I	10/6/2020	Passed	[10/6] Passed. Include version number in the app.
MMTPA-TRA002-V01	To demonstrate the ability for a user to opt in or opt out of allowing anonymized trip data to be transmitted to the Operating System	Terms and Conditions	Pivot app requires users to review and accept terms and conditions for using the app.	<p><u>Pre-condition:</u> Pivot is installed; Pivot has never been opened.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Open Pivot for first time. 2. Click 'Allow while using the app' to provide access for location in real-time. 3. Click 'Allow Notifications' to receive notifications within the app. 4. Review terms and conditions for providing data. 5. Click 'Accept' to agree to terms and conditions. <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: Tester has reviewed and agreed to the terms and conditions of the Pivot app.</p> <p><u>Post-condition:</u> Pivot is open.</p>	Traveler I	10/6/2020	Passed	[10/6] Passed. Android by default allows notifications, so Step 3 is not applicable.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRA003-V01	To provide user with instructions for use of the app and educational material pertaining to each mode of service.	Educational Material	Instructions for using the Pivot app are accessible and up to date.	<p><u>Pre-condition:</u> Pivot is open; tester does not have an account.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the menu button (three bars icon) at the top left of the screen and click "Help". 2. Click the "Show Me" button. 3. Review the instructions. 4. Verify the instructions aid in general understanding of the app and provide information relevant to each functionality and mode of service provided in the app. <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: Instructions are presented to the user to assist in general understanding of the app.</p> <p><u>Post-condition:</u> N/A</p>	Traveler I	10/6/2020 10/26/2020	Failed Passed	<p>[10/6] Still referencing old interface.</p> <p>Suggestion to be able to click through the instructions or expand/collapse content areas.</p> <p>Connect Accounts image does not correspond to the text – looks like placeholder images.</p> <p>Suggestion to be able to tap on the screenshots to view larger.</p> <p>[10/26] Passed.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRA004-V01	To successfully register a new Pivot account and verify user identity through process of two-factor authentication.	Register Account	Tester can complete multi-factor authentication to register a new account.	<p><u>Pre-condition:</u> Pivot is open; tester does not have an account.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click the menu button (three bars icon) at the top left of the screen. 2. Click "SIGN UP." 3. Enter First Name, Last Name, Phone, Email Address, and Password (2x). 4. Press "Register." 5. Confirm your registration by selecting to receive a verification code via phone 6. Enter the 6-digit verification code in the app and press "Confirm" 7. Verify that registration completed successfully and click on the "Continue" button to be brought back to the map. 8. Press the menu button again (three bars icon) at the top left of the screen to verify that you are logged into the app. 9. Click on "View Profile" to verify your account information. 10. Change your profile information and click on the "Update" button 11. Close and reopen the app to verify that your profile information has been updated <p><u>Pass criteria:</u> Verification by two independent testers on Android and iOS devices: Tester has created an account and is logged in. Tester can access and update profile information.</p> <p><u>Post-condition:</u> Registration is complete; tester is logged in.</p>	Traveler I	10/6/2020	Passed	[10/6] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRA005-V01	To demonstrate the ability for a user to reset his/her password if forgotten.	Recover password	Tester can recover password.	<p><u>Pre-condition:</u> Pivot is open.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Open log in screen to type in email address associated with account. 2. Click the forgot password button to confirm email address. 3. Open email and click link to reset password. 4. Confirm password is valid by logging into Pivot. <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices. Tester can change password through Pivot with confirmation email.</p> <p><u>Post-condition:</u> Tester is logged in.</p>	Traveler I	10/6/2020	Passed	<p>[10/6] Passed.</p> <p>Suggestion to add a logout button.</p> <p>Suggestion to add a Recover Password option without having to uninstall the app.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRA006-V01	To incorporate individual preference for mode/service in search results	User Preferences	Trip itineraries are created in accordance with user preference for mode/service.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Select "Preferred Modes" option. 3. Select a mode(s) that was not previously selected. 4. Toggle next to "Push", "SMS" and "Email" to turn on notifications. 5. Return to the previous screen by selecting the left arrow. 6. Confirm the number of selected modes has updated. 7. Exit settings panel. 8. Plan a trip that includes the new mode in the trip search results. 9. Verify that the new mode is included in the trip search results. <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: Preferred mode/service is reflected in the trip search results.</p> <p><u>Post-condition:</u> Settings panel is closed; preferred modes are updated.</p>	Traveler I	10/6/2020	Passed	[10/6] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRA007-V01	To incorporate individual preference for maximum total cost in search results	User Preferences	Trip itineraries are created in accordance with user preference for max cost.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Press the dollar amount next to "Max Cost Per Trip." 3. Use the slider to change the amount, then press "Apply." 4. Confirm that the dollar amount displayed next to "Max Cost Per Trip" changed to the selected amount. 5. Toggle next to "Push", "SMS" and "Email" to turn on notifications. 6. Exit the setting panel. 7. Plan a trip. 8. Verify that the max cost of the trip search results did not exceed the amount set under settings. <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: Max cost per trip is reflected in the trip search results.</p> <p><u>Post-condition:</u> Settings panel is closed; preferred modes are updated.</p>	Traveler I	10/6/2020	Passed	[10/6] Passed. Distance in miles to AMC Indian Mound 9 is showing up as "NaN mi".

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRA008-V01	To incorporate individual preference for maximum number of trip segments in search results	User Preferences	Trip itineraries are created in accordance with user preference for max transfers.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Press the number next to "Max Transfers." 3. Use the slider to change the number, then press "Apply." 4. Confirm that the number displayed next to "Max Transfers" changed to the selected amount. 5. Toggle next to "Push", "SMS" and "Email" to turn on notifications. 6. Exit the settings panel. 7. Plan a trip. 8. Verify that the max transfers amount is reflected in the trip search results (for example, search results now show a max of two transfers, whereas before, results showed three). <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: Max transfers is reflected in the trip search results.</p> <p><u>Post-condition:</u> Settings panel is closed; preferred modes are updated.</p>	Traveler I	10/6/2020	Passed	[10/6] Passed.
MMTPA-TRA009-V01	To filter search results by cheapest or quickest route	User Preferences	Trip itineraries are ordered in accordance with user preference for cheapest or quickest route.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Enter an origin and destination to search for a trip. 2. Click "suggest" next to sort. 3. Select desired sorting option, either cheapest or quickest. <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: Results are sorted in order of cheapest or quickest route.</p> <p><u>Post-condition:</u> N/A</p>	Traveler I	10/6/2020	Passed	[10/6] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRA010-V01	To incorporate individual preference for maximum walking distance in search results	User Preferences	Trip itineraries are created in accordance with user preference for max walking distance.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Press the number next to “Max Walking Distance.” 3. Change the number, then press “Apply.” 4. Confirm that the number displayed next to “Max Walking Distance” changed to the selected amount. 5. Toggle next to “Push”, “SMS” and “Email” to turn on notifications. 6. Exit the settings panel. 7. Plan a trip. 8. Verify that the max walking distance is reflected in the trip search results (for example, search results now show an increase or decrease in walking distance for the walking portion of the trip). <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: User’s preferred maximum walking distance is updated and displayed in the trip itinerary. Note: If user selects a walking distance of 0, results will be returned with a minimum walk distance necessary to get to mode.</p> <p><u>Post-condition:</u> Settings panel is closed; preferred modes are updated.</p>	Traveler I Traveler II	10/6/2020 10/13/2020	Deferred Passed	<p>[10/6] Walk distance is not displayed in the vertical trip plan or after clicking on the individual trip – not possible to verify currently. Same comment applies to bike trips – users will need to know the distance of the leg of the trip (e.g. I need to know how far to bike or walk)</p> <p>Walk distance should display in the trip itinerary. Pass criteria should be updated to reflect user’s max walking distance in search results.</p> <p>[10/13] Passed.</p> <p>Defect MMTPA-APP-DEF001 logged and closed.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRA011-V01	To incorporate individual preference for accessible vehicle in search results that includes ride hailing	User Preferences	Trip itineraries exclude non-accessible vehicles.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Toggle on "Wheelchair Accessibility" to turn on the option. (Note: you can also click on the preferred modes in the settings to see which modes are active.) 3. Plan a trip to a destination. 4. Verify a non-ADA vehicle (e.g., scooter) is not presented. 5. Select a trip with ride hail (taxi). 6. Verify the vehicle that arrives can accommodate a wheelchair passenger. <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: Modes presented meet the disability requirements and the vehicle that arrives can accommodate those requirements.</p> <p><u>Post-condition:</u> An accessible vehicle arrives.</p>	Traveler I Traveler II	10/6/2020 10/13/2020	Deferred Passed	<p>[10/6] Think about whether "walk" should be the word under the wheelchair option. Consider changing to ride hail. [10/13] Passed.</p> <p>Defect MMTPA-APP-DEF002 logged and resolved.</p> <p>Defect MMTPA-APP-DEF015 logged and resolved.</p> <p>Defect MMTPA-APP-DEF002 logged and resolved.</p> <p>Defect MMTPA-APP-DEF003 logged and resolved.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRA012-V01	To incorporate individual preference for accessible vehicle in search results that includes COTA bus service	User Preferences	Trip itineraries exclude non-ADA vehicles.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in; tester has wheelchair-accessible option active in preferences.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Toggle on "Wheelchair Accessibility" to turn on the option. 3. Plan a trip to a destination. 4. Verify a non-ADA vehicle (e.g., scooter) is not presented. 5. Select a trip with COTA. 6. Verify the vehicle that arrives can accommodate a wheelchair passenger. <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: Modes presented meet the disability requirements and the vehicle that arrives can accommodate those requirements.</p> <p><u>Post-condition:</u> An accessible vehicle arrives.</p>	Traveler I	10/6/2020	Passed	[10/6] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRA013-V01	To incorporate individual preference for accessible vehicle in search results	User Preferences	Trip itineraries exclude non-ADA modes.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen. 2. Press the switch next to "Wheelchair Accessible" to enable this option. 3. Verify in the trip search that the options are wheelchair accessible and that other modes (e.g., scooters) have been removed from the options presented. <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: The options presented to the user can accommodate wheelchairs. The options presented are walking (or rolling), car, public transit, and ride hail. Scooter and bike are not shown.</p> <p><u>Post-condition:</u> The results presented are wheelchair accessible.</p>	Traveler I	10/6/2020	Passed	[10/6] Passed.
MMTPA-TRA014-V01	To filter search results by environmental impact or "greenest" trip	User Preferences	Trip itineraries can be sorted by "eco-friendly".	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Enter an origin and destination to search for a trip. 2. Click "suggest" (next to sort). 3. Select "Eco-Friendly." 4. Verify results. <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: User's preferred sorting method changed. Travel options updated to match this choice.</p> <p><u>Post-condition:</u> N/A</p>	Traveler I	10/6/2020	Passed	[10/6] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRA015-V01	To successfully search for nearby bus stops based on user's location.	Rides-Near-Me	A list of bus stops is presented to the traveler.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u> 1. Click on the "Bus Stops" button to view the list of available bus stop information.</p> <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: Nearby bus stops are shown in the list; clicking on each stop updates the map and provides more information about the stop. Testers can see the same results by clicking on the bus stop on the map.</p> <p><u>Post-condition:</u> N/A</p>	Traveler I	10/6/2020	Passed	[10/6] Passed.
MMTPA-TRA016-V01	To successfully search for a scooter based on user's location.	Rides-Near-Me	A list of scooter locations is presented to the traveler.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u> 1. Click on the "Rentals" button to view scooter options 2. Review ride options on the map. 3. Verify that rides appear by mode, by color, with mobility provider identified on the list. 4. Click on a mode to zoom to the location of selected ride.</p> <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: Nearby scooter options are shown in the list; clicking on the ride updates the map with the location of the mode.</p> <p><u>Post-condition:</u> N/A</p>	Traveler I	10/6/2020	Passed	[10/6] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRA017-V01	To successfully search for a bike based on user's location.	Rides-Near-Me	A list of bike locations is presented to the traveler.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Press "Rentals" button to view bike options. 2. Review ride options on the map. 3. Verify that rides appear by mode, by color, with mobility provider identified on the list. 4. Click on interactive list to zoom to the location of selected ride. <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: Nearby bike options are shown in the list; clicking on the ride updates the map with the location of the mode.</p> <p><u>Post-condition:</u> N/A</p>	Traveler I	10/6/2020	Passed	[10/6] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRA018-V01	To successfully update prices in real time for ride-hailing.	Trip Itineraries	Travel time and costs are updated in near real-time for ride-hailing trips.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Select "Preferred Modes" option. 3. Click on the Ride-hailing options to turn on. 4. Return to the previous screen by selecting the left arrow on top left side of the screen. 5. Enter destination address in the "Where To?" search bar. 6. Enter start address or choose current location as a starting point of the trip. 7. Click "LEAVE NOW" to select the date and time of the trip start time or arrival time. 8. Plan a trip to the selected destination. 9. Review the trip options and find one with ride-hailing (taxi). 10. Record or screenshot the results, noting the travel time and cost. 11. Enter a different destination address in the search bar that is at least 0.5 mile away from the original location. 12. Review trip option and find one with ride-hailing. 13. Verify that the travel time and cost have updated. <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: After changing the destination location, the travel time and cost will have updated accordingly for ride-hailing.</p> <p><u>Post-condition:</u> An updated trip itinerary is presented.</p>	Traveler I	10/6/2020	Passed	[10/6] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRA019-V01	To successfully update prices in real time for scooters.	Trip Itineraries	Travel time and costs are updated in near real-time for scooter trips.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Select "Preferred Modes" option. 3. Click on the scooter option to turn on. 4. Return to the previous screen by selecting the left arrow on top left side of the screen. 5. Enter destination address in the "Where To?" search bar. 5. Enter start address or choose current location as a starting point of the trip. 6. Click "LEAVE NOW" to select the date and time of the trip start time or arrival time 7. Plan a trip to the selected destination. 8. Review the trip options and find one with scooter. 9. Record or screenshot the results, noting the travel time and cost. 10. Enter a different destination address in the search bar that is at least 0.5 mile away from the original location. 11. Review trip option and find one with scooters. 12. Verify that the travel time and cost have updated. <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: After changing the destination location, the travel time and cost will have updated accordingly for travel by scooter.</p> <p><u>Post-condition:</u> An updated trip itinerary is presented.</p>	Traveler I	10/6/2020	Passed	[10/6] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRA020-V01	To successfully plan a trip when internet connectivity is temporarily lost.	Offline Use	<p>Traveler is alerted when Pivot is offline and when network connectivity is restored.</p> <p>---</p> <p>Traveler is alerted to being offline and is still able to view cached information in the Pivot app.</p>	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Use the map to select destination location. 2. Plan a route that involves one or more of the following modes: bike, scooter, and public transit. 3. Place the app into "Airplane mode" in which internet connection is lost, and the application is unable to retrieve real-time updates or operate as intended. 4. Verify the user is alerted of lost connectivity and impact on service. 5. Confirm your ability to view last known information for bikes, scooters, and/or public transit without real-time data by using the map to set location. 6. Confirm ability to check COTA schedules without real-time data by clicking on the "Bus Stops" button. 7. Turn off airplane mode on the phone to restore internet connectivity to the app. 8. Verify that offline alerts are removed, and that service is restored. <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: User is alerted that app is offline; user can plan trip without real-time data; user can view nearby rides without real-time data; user cannot book trip while offline. User is alerted when connectivity is restored.</p> <p><u>Post-condition:</u> Connectivity is restored.</p>	Traveler I Traveler II	10/6/2020 10/19/2020	Failed Passed	<p>[10/6] Failed as a result of Step 6 and pass criteria – may need further discussion as to what functionality needs to be available in offline mode. Step 6 will require bus stop information to be cached on the phone in order to be passed.</p> <p>When everyone turned off Wi-Fi too, a Wi-Fi symbol with a red x was visible when the app was opened.</p> <p>Trip options stayed visible and user could click on each trip and see detailed information.</p> <p>Is there supposed to be a pop-up too? This could be more effective from the UI.</p> <p>[10/19] Passed. Previous Step 6 removed</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRA021-V01	To demonstrate that the GUI allows for effective use of the application	User Interface	The GUI is intuitive and easy to use, and allows for effective use of the Pivot app.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Verify that GUI elements such as map, text, icons, and font are organized to be intuitive and easy to understand to allow for effective use of the application. 2. Confirm the ability to navigate between screens without loss of data or having to start over. 3. Confirm that the GUI elements appear professional and exhibit a consistent "look and feel." <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: The app provides a GUI that passes basic tests for effective use.</p> <p><u>Post-condition:</u> N/A</p>	Traveler I	10/6/2020	Passed	[10/6] Passed. Defect MMTPA-APP-DEF017 logged and resolved.
MMTPA-TRA022-V01	To demonstrate ability to set preferred language in the app	Languages	Travelers can select English or Spanish as the display language in Pivot.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Press the gear at the top right of the screen. 2. Press 'English' under display language option. 3. Change the desired language to Spanish. 4. Verify the display language updates to Spanish. <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: The display language shows the selected language. The text updates to the selected language.</p> <p><u>Post-condition:</u> App displays text in Spanish.</p>	Traveler I	10/6/2020	Passed	[10/6] Passed. Defect MMTPA-APP-DEF014 logged and resolved. Defect MMTPA-APP-DEF022 logged and resolved.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRA023-V01	To demonstrate access to training and educational material in user's preferred language - Spanish	Languages	Travelers can view education material in either English or Spanish.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Press the gear at the top right of the screen. 2. Press 'English' under display language option. 3. Change the desired language to Spanish. 4. Verify the display language updates to Spanish. 5. Go back to the home page of the app. 6. Press the menu button (three bars icon) at top left of screen. 7. Press "Ayuda". 8. Click "Muéstrame". 9. Verify that the help site is displayed in Spanish. <p><u>Pass criteria:</u> Verification by at least two independent testers on Android and iOS devices: The help site is displayed in Spanish.</p> <p><u>Post-condition:</u> The app remains open in the background as the help site opens.</p>	Traveler I	10/6/2020	Passed	[10/13 – 10/16] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRB001-V01	To demonstrate the ability to plan trips in accordance with Bird's electric scooter sharing policies.	Planning and Booking	Tester is directed to the app/play store to download and install the Bird scooter app.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in; the Bird scooter app is not installed.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Tester clicks on the Rentals tab. 2. Tester selects a Bird scooter from the list or map and clicks on the link icon to the right of the selected scooter. 3. Tester is taken to app/play store to download and install the Bird scooter app. 4. Tester downloads the Bird app from the app store on the smartphone. 5. Tester opens the Bird app 6. When prompted for location services, select 'Allow While Using App' to enable location services. 7. Enter the email address or sign in with Apple or Google. 8. When prompted to use Bluetooth, select 'Don't Allow or "OK"'. <p><u>Expected result:</u> Tester is directed to download and install the Bird scooter app.</p> <p><u>Post-condition:</u> Bird scooter app is installed on smartphone.</p>	Traveler II	10/13/2020 – 10/16/2020	Passed	[10/13 – 10/16] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRB002-V01	To demonstrate the ability to plan trips in accordance with Bird's electric scooter sharing policies.	Planning and Booking	Tester is directed to the smartphone's Bird scooter app when selecting a Bird electric scooter trip.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in; the Bird app is installed.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Tester clicks on the Rentals tab 2. Tester selects a Bird scooter from the list or map and clicks on the link icon to the right of the selected scooter. 3. Tester is taken directly to the Bird scooter app on the smartphone. 4. Tester can log into the Bird scooter app (if not already logged in). 5. Tester is directed to the Bird scooter that was selected within Pivot. <p><u>Expected result:</u> Tester is directed to the installed Bird scooter app on smartphone.</p> <p><u>Post-condition:</u></p>	Traveler II	10/13/2020 – 10/16/2020	Passed	[10/13 – 10/16] Passed.
MMTPA-TRB003-V01	To demonstrate seamless deep linking from Pivot to external apps for payment.	Payment	Tester can complete payment for a Bird scooter trip and execute trip.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in; the Bird scooter app is installed.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Tester clicks on the Rentals tab 2. Tester selects a Bird scooter from the list or map and clicks on the link icon to the right of the selected scooter. 3. Tester is taken directly to the Bird scooter app on the smartphone. 4. Tester can log into the Bird scooter app (if not already logged in). 5. Tester will be directed to the Bird scooter location that was selected within Pivot. 6. Tester clicks on camera icon to scan the scooter's QR code located on the Bird scooter to unlock the scooter. 7. Tester pays and executes the scooter trip. <p><u>Pass criteria:</u> Tester can pay for Bird scooter trip.</p> <p><u>Post-condition:</u></p>	Traveler II	10/13/2020 – 10/16/2020	Passed	<p>[10/13 – 10/16] Passed.</p> <p>Test procedure does not have the Wallet steps that Lime has.</p> <p>The user isn't taken to the specific scooter selected but is asked to scan the barcode of the scooter. This makes sense because scooter selected could be gone by the time traveler gets there or the location could be a few feet off due to GPS.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRB004-V01	To demonstrate the ability to book trips in accordance with Lime's electric scooter sharing policies.	Planning and Booking	Tester is directed to the app/play store to download and install the Lime scooter app.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in; the Lime scooter app is not installed.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Tester clicks on the Rentals tab. 2. Tester selects a Lime scooter from the list or map and clicks on the link icon to the right of the selected scooter. 3. Tester is taken to app/play store to download and install the Lime scooter app. 4. Tester downloads the lime app from the app/play store on the smartphone. 5. Tester opens the Lime app. 6. Sign in with Apple or click 'Other options' and select 'Phone number', 'Email' or 'Social' to register with Lime app. 7. A confirmation link will be sent to the registered email. Click on the link emailed on the mobile device to confirm registration, 8. When prompted to use Bluetooth, select 'Don't Allow or "OK"'. 9. When prompted for location services, select "Allow While Using App" to enable location services. 10. In Apple, when prompted for notifications, select 'Don't Allow' or 'Allow' to enable notifications. 11. Enter the email address or sign in with Apple or Google. 12. When prompted to use Bluetooth, select 'Don't Allow or "OK"'. 13. Tester now created an account with Lime app. <p><u>Expected result:</u> Tester is directed to download and install the Lime scooter app.</p> <p><u>Post-condition:</u> Lime scooter app is installed on tester's smartphone.</p>	Traveler II	10/13/2020 – 10/16/2020	Passed	[10/13 – 10/16] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRB005-V01	To demonstrate the ability to plan trips in accordance with Lime's electric scooter sharing policies.	Planning and Booking	Tester is directed to the smartphone's Lime scooter app when selecting a Lime electric scooter trip.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in; the Lime app is installed.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Tester clicks on the Rentals tab 2. Tester selects a Lime scooter from the list or map and clicks on the link icon to the right of the selected scooter. 3. Tester is taken directly to the Lime scooter app on the smartphone. Lime app is now open 4. Tester can log into the Lime scooter app (if not already logged in). 5. Tester is directed to the Lime scooter that was selected within Pivot. <p><u>Expected result:</u> Tester is directed to the Lime scooter app on smartphone.</p> <p><u>Post-condition:</u></p>	Traveler II	10/13/2020 – 10/16/2020	Passed	[10/13 – 10/16] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRB006-V01	To demonstrate seamless deep linking from Pivot to external apps for payment.	Payment	Tester can complete payment for a Lime scooter trip and execute trip. Trip information is transmitted to Pivot.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in; the Lime scooter app is installed.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Tester clicks on the Rentals tab 2. Tester selects a Lime scooter from the list or map and clicks on the link icon to the right of the selected scooter. 3. Tester is taken directly to the Lime scooter app on the smartphone. Lime app is now open 4. Tester can log into the Lime scooter app (if not already logged in). 5. Tester will be directed to the Lime scooter that was selected within Pivot. 6. Click on the three lines located on top of the screen, click on 'Wallet' to add payment method. 7. Click 'Manage Payment Methods' and select 'Add Card' to enter credit card information. 8. Either add funds to the account using the credit card or use credit card for payment. 9. Tester clicks 'Scan to Ride' to scan the scooter's QR code located on the Lime scooter to unlock the scooter. 10. Tester pays and executes the scooter trip. <p><u>Pass criteria:</u> Tester can pay for Lime scooter trip.</p> <p><u>Post-condition:</u></p>	Traveler II	10/14/2020	Passed	[10/14] Passed. The user isn't taken to the specific scooter selected but is asked to scan the barcode of the scooter. This makes sense because scooter selected could be gone by the time traveler gets there or the location could be a few feet off due to GPS.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRB007-V01	To demonstrate the ability to book trips in accordance with CoGo's bike share policies.	Planning and Booking	Tester is directed to the app/play store to download and install the Lyft app.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in; the Lyft app is not installed.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Tester clicks on the Rentals tab. 2. Tester selects a CoGo bike from the list or map and clicks on the link icon to the right of the selected bike. 3. Tester is taken to app/play store to download and install the Lyft app. 4. Tester downloads the Lyft app from the app/play store on the smartphone. 5. Tester opens the Lyft app. 6. Click 'Get Started'. 7. when prompted for location services, click 'Allow While Using App' to enable location services. 8. Enter mobile number to register with the Lyft and click the side arrow. 9. Enter the confirmation code sent to the registered phone number. 10. Enter First name and last name. 11. Enter email address. 12. Click 'I Agree' to accept Lyft Terms of Service. 13. Enter payment information or select apple pay (iOS only) for payments. 14. Enter 15. View and select all CDC guidelines and click 'I accept'. 16. Click 'Allow' for notifications or click 'x' located on top left to exit the screen. 17. Tester has now created an account with Lyft app. <p><u>Expected result:</u> Tester is directed to download and install the Lyft app.</p> <p><u>Post-condition:</u> Lyft app is installed on tester's smartphone.</p>	Traveler II	10/14/2020 10/19/2020	Failed Passed	<p>[10/14] Link takes you to "Oops... Sorry we can't find that page"</p> <p>[10/19] Passed.</p> <p>Defect MMTPA-APP-DEF005 logged and resolved.</p> <p>Defect MMTPA-APP-DEF006 logged and closed.</p> <p>Defect MMTPA-APP-DEF007 logged and resolved.</p> <p>Defect MMTPA-APP-DEF009 logged and resolved.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRB008-V01	To demonstrate the ability to book trips in accordance with CoGo's bike share policies.	Planning and Booking	Tester is directed to the smartphone's Lyft app when selecting a CoGo bike trip.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in; the Lyft app is installed.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Tester clicks on the Rentals tab 2. Tester selects a CoGo bike from the list or map and clicks on the link icon to the right of the selected bike. 3. Tester is taken directly to the Lyft app on the smartphone. 4. Tester can log into the Lyft app (if not already logged in). 5. Camera is turned on to scan the QR code on bike. <p><u>Expected result:</u> Tester is directed to the CoGo bike share app on smartphone.</p> <p><u>Post-condition:</u></p>	Traveler II	10/13/2020 – 10/16/2020	Passed	[10/13 – 10/16] Passed.
MMTPA-TRB009-V01	To demonstrate seamless deep linking from Pivot to external apps for payment.	Payment	Tester can complete payment for a CoGo bike trip and execute trip.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in; the Lyft app is installed.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Tester clicks on the Rentals tab 2. Tester selects a CoGo bike from the list or map and clicks on the link icon to the right of the selected bike. 3. Tester is taken directly to the Lyft app on the smartphone. 4. Tester can log into the Lyft app (if not already logged in). 5. Camera is turned on to scan the QR code on vehicle. 6. Tester scans the QR code on the bike 7. Tester selects the option to pay for bike. 8. Tester executes the bike trip. <p><u>Pass criteria:</u> Tester can pay for CoGo bike trip.</p> <p><u>Post-condition:</u></p>	Traveler II	10/13/2020 – 10/16/2020	Passed	[10/13 – 10/16] Passed. Step 7 automatically happens once QR code is scanned. Defect MMTPA-APP-DEF008 logged and resolved.

MMTPA-TRB010-V01	To demonstrate the ability to book trips in accordance with individual mobility providers and to receive confirmation	Planning and Booking User Feedback	Traveler can book a multimodal trip in accordance with policies of Lime scooter	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in. Tester has selected Public Transit and Lime scooter as the only preferred modes. Tester has notifications (Push, SMS, and Email) toggled on.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on "Where To?" and enter a destination in Columbus, OH. 2. Select trip 3. Press "Start" to begin the trip. 4. Click 'Ok to agree to the scooter policy. 5. Walk to the location of the Lime scooter. 6. Click on the 'Chain' next to Lime within the trip to open the Lime app. 7. Click "Scan the code" to scan the barcode on the scooter. 8. Pay and unlock the scooter. 9. Ride the Lime scooter to the next segment of the trip. 10. Click 'Lock' in the Lime app to finish the scooter ride. 11. Verify Pivot app provides notifications alerting of the next trip segment. 12. Open Pivot app and note the COTA bus number. 13. Wait for the COTA bus at the bus stop. 14. Take COTA bus to the next segment of the trip. 15. Walk to the destination which is the last segment of the trip. 16. Click end trip to see a popup to provide feedback on the screen once the trip is completed. 17. Enter rating and click 'Ok" <p><u>Pass criteria:</u> Verification by two independent testers on Android and iOS devices. Tester can book a trip and receive notifications of when the service will arrive. Tester can complete a trip and provide feedback on each segment and overall trip experience.</p> <p><u>Post-condition:</u> Trip has completed; updated trip metrics will be available in 24 hours in the pivot app.</p>	Traveler II	10/13/2020 – 10/16/2020	Passed	[10/13 – 10/16] Passed.
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TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRB011-V01	To demonstrate trip metrics in the Metrics section of the Pivot app.	Metrics	Trip metrics are updated in the Metrics section of the Pivot app.	<p><u>Pre-condition:</u> Pivot is open; tester has completed the steps above to complete a trip; 24 hours have elapsed since the completed trip.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the menu button (three bars icon) at the top left of the screen and click "Trip Metrics". 2. Review updates to the walk, bus and scooter metrics. <p><u>Pass criteria:</u> Trip metrics have updated in the past 24 hours for the trip taken.</p> <p><u>Post-condition:</u> Tester will only see gallons saved, exercise, and bus metrics if modes other than car are selected.</p>	Traveler II	10/13/2020 – 10/16/2020	Passed	[10/13 – 10/16] Passed.

MMTPA-TRB012-V01	To demonstrate the ability to book trips in accordance with individual mobility providers and to receive confirmation	Planning and Booking User Feedback	Traveler can book a multimodal trip in accordance with policies of Bird scooter	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in. Tester has selected Public Transit and Bird scooter as the only preferred modes. Tester has notifications (Push, SMS, and Email) toggled on.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on "Where To?" and enter a destination in Columbus, OH. 2. Select trip 3. Press "Start" to begin the trip. 4. Click 'Ok' to agree to the scooter policy. 5. Note the COTA bus number and walk to the bus (if CBUS or CMAX the bus will not be labeled). 6. Wait for the COTA bus at the bus stop. 7. Take COTA bus to the next segment of the trip. 8. Verify the Pivot app provides navigation to the scooter (note: if scooter is not available at the next trip segment, tester will be notified) 9. Walk to the location of the Bird scooter. 10. Click on the 'Chain' next to Bird within the trip to open the Bird app. 11. Click "Scan the code" to scan the barcode on the scooter. 12. Pay and unlock the scooter. 13. Ride the Bird scooter to the next segment of the trip. 14. Click 'Lock' in the Bird app to finish the scooter ride. 15. Walk to the destination which is the last segment of the trip 16. Click end trip to see a popup to provide feedback on the screen once the trip is completed. 17. Enter rating and click 'Ok" <p><u>Pass criteria:</u> Verification by two independent testers on Android and iOS devices. Tester can book a trip and receive notifications of when the service will arrive. Tester can complete a trip and provide feedback on each segment and overall trip experience.</p> <p><u>Post-condition:</u></p>	Traveler II	10/13/2020 – 10/16/2020	Passed	[10/13 – 10/16] Passed. Defect MMTPA-APP-DEF019 logged and closed.
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TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
				Trip has completed; updated trip metrics will be available in 24 hours in the pivot app.				
MMPA-TRB013-V01	To demonstrate trip metrics in the Metrics section of the Pivot app.	Metrics	Trip metrics are updated in the Metrics section of the Pivot app.	<p><u>Pre-condition:</u> Pivot is open; tester has completed the steps above to complete a trip; 24 hours have elapsed since the completed trip.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the menu button (three bars icon) at the top left of the screen and click "Trip Metrics". 2. Review updates to the walk, bus and scooter metrics. <p><u>Pass criteria:</u> Trip metrics have updated in the past 24 hours for the trip taken.</p> <p><u>Post-condition:</u> Tester will only see gallons saved, exercise, and bus metrics if modes other than car are selected.</p>	Traveler II	10/13/2020 – 10/16/2020	Passed	[10/13 – 10/16] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRB014-V01	To demonstrate the ability to book trips in accordance with individual mobility providers and to receive confirmation	Planning and Booking User Feedback	Traveler can book a multimodal trip in accordance with policies of CoGo bike	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in. Tester has selected Public Transit and CoGo bike as the only preferred modes. Tester has notifications (Push, SMS, and Email) toggled on.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on "Where To?" and enter a destination in Columbus, OH. 2. Press "Start" to begin the trip. 3. Walk to the location of the CoGo bike. 4. Click on the 'Chain' next to CoGo within the trip to open the Lyft app. 5. Click "Scan the code" to scan the barcode on the bike. 6. Pay and unlock the bike. 7. Ride the CoGo bike to the next segment of the trip. 8. Dock the bike to the CoGo docking station to finish the bike ride. 9. Verify Pivot message to click on Trip in Progress and navigate to the bus stop. 10. Walk to the COTA bus stop. 11. Wait for the COTA bus at the bus stop. 12. Take COTA bus to the next segment of the trip. 13. Walk to the destination which is the last segment of the trip. 14. Click end trip to see a popup to provide feedback on the screen once the trip is completed. 15. Enter rating and click 'Ok' <p><u>Pass criteria:</u> Verification by two independent testers on Android and iOS devices. Tester can book a trip and receive notifications of when the service will arrive. Tester can complete a trip and provide feedback on each segment and overall trip experience.</p> <p><u>Post-condition:</u> Trip has completed; updated trip metrics will be available in 24 hours in the pivot app.</p>	Traveler II	10/13/2020 – 10/16/2020	Passed	[10/13 – 10/16] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRB015-V01	To demonstrate trip metrics in the Metrics section of the Pivot app.	Metrics	Trip metrics are updated in the Metrics section of the Pivot app.	<p><u>Pre-condition:</u> Pivot is open; tester has completed the steps above to complete a trip; 24 hours have elapsed since the completed trip.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the menu button (three bars icon) at the top left of the screen and click "Trip Metrics". 2. Review updates to the walk, bus and bike metrics. <p><u>Pass criteria:</u> Trip metrics have updated in the past 24 hours for the trip taken.</p> <p><u>Post-condition:</u> Tester will only see gallons saved, exercise, and bus metrics if modes other than car are selected.</p>	Traveler II	10/13/2020 – 10/16/2020	Passed	[10/13 – 10/16] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRB016-V01	To demonstrate the ability to book and complete a multimodal trip.	Planning and Booking Notifications and Alerts User Feedback	Pivot app notifies travelers when reaching a termination point or a transfer point. --- Pivot app alerts travelers to alternative routes and/or modes in cases of increased travel time.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in. Tester has selected Public Transit and ride-hail as the only preferred modes. Tester has notifications (Push, SMS, and Email) toggled on.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on "Where To?" and enter a destination in Columbus, OH. 2. Click on a trip option which has ride-hail and COTA as modes of transportation. 3. Select 'Uber' as ride-hail option. 4. Click "Start" to begin the trip. 5. Walk to the COTA bus stop. Note the bus number from the Pivot trip details. 6. Take the COTA bus and reach the next trip segment. 7. Click on the arrow within the trip segment next to Uber to open the Uber app. 8. Pay and execute the Uber ride to the trip destination. 9. Click 'End' to end the trip within the Pivot app. 10. A popup to provide feedback will be prompted on the screen once the trip is completed. 11. Enter rating and click 'OK'. <p><u>Pass criteria:</u> Verification by two independent testers on Android and iOS devices. Tester can book a trip and receive notifications of when the service will arrive. Tester can complete a trip and provide feedback on each segment and overall trip experience. Tester can open the Uber app through the Pivot app to book the ride.</p> <p><u>Post-condition:</u></p>	Traveler II	10/20/2020 – 10/23/2020	Passed	<p>[10/20 – 10/23] Passed.</p> <p>Defect MMTPA-APP-DEF020 logged and resolved.</p> <p>Defect MMTPA-APP-DEF021 logged and resolved.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRB017-V01	To demonstrate trip metrics in the Metrics section of the Pivot app.	Metrics	Trip metrics are updated in the Metrics section of the Pivot app.	<p><u>Pre-condition:</u> Pivot is open; tester has completed the steps above to complete a trip; 24 hours have elapsed since the completed trip.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the menu button (three bars icon) at the top left of the screen and click "Test Metrics". 2. Review updates to the bus and ride-hail trip metrics. <p><u>Pass criteria:</u> Trip metrics have updated in the past 24 hours for the trip taken.</p> <p><u>Post-condition:</u> Tester will only see gallons saved, exercise, and bus metrics if modes other than car are selected.</p>	Traveler II	10/20/2020 – 10/23/2020	Passed	[10/20 – 10/23] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRB018-V01	To demonstrate the ability to book and complete a multimodal trip.	Planning and Booking Notifications and Alerts User Feedback	Pivot app notifies travelers when reaching a termination point or a transfer point. --- Pivot app alerts travelers to alternative routes and/or modes in cases of increased travel time.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in. Tester has selected Public Transit and ride-hail as the only preferred modes. Tester has notifications (Push, SMS, and Email) toggled on.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on "Where To?" and enter a destination in Columbus, OH. 2. Click on a trip option which has ride-hail and COTA as modes of transportation. 3. Select 'Lyft' as ride-hail option. 4. Click "Start" to begin the trip. 5. Walk to the COTA bus stop. Note the bus number from the Pivot trip details. 6. Take the COTA bus and reach the next trip segment. 7. Click on the arrow within the trip segment next to Lyft to open the Lyft app. 8. Pay and execute the Lyft ride to the trip destination. 9. Click 'End' to end the trip within the Pivot app. 10. A popup to provide feedback will be prompted on the screen once the trip is completed. 11. Enter rating and click 'OK'. <p><u>Pass criteria:</u> Verification by two independent testers on Android and iOS devices. Tester can book a trip and receive notifications of when the service will arrive. Tester can complete a trip and provide feedback on each segment and overall trip experience.</p> <p><u>Post-condition:</u></p>	Traveler II	10/20/2020 – 10/23/2020	Passed	[10/20 – 10/23] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRB019-V01	To demonstrate trip metrics in the Metrics section of the Pivot app.	Metrics	Trip metrics are updated in the Metrics section of the Pivot app.	<p><u>Pre-condition:</u> Pivot is open; tester has completed the steps above to complete a trip; 24 hours have elapsed since the completed trip.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the menu button (three bars icon) at the top left of the screen and click "Test Metrics". 2. Review updates to the bus and ride-hail trip metrics. <p><u>Pass criteria:</u> Trip metrics have updated in the past 24 hours for the trip taken.</p> <p><u>Post-condition:</u> Tester will only see gallons saved, exercise, and bus metrics if modes other than car are selected.</p>	Traveler II	10/20/2020 – 10/23/2020	Passed	[10/20 – 10/23] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRB020-V01	To demonstrate the ability to book and complete a multimodal trip.	Planning and Booking Notifications and Alerts User Feedback	Pivot app notifies travelers when reaching a termination point or a transfer point. --- Pivot app alerts travelers to alternative routes and/or modes in cases of increased travel time or when the planned transportation mode is no.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in. Tester has selected Public Transit and Yellow Cab as the only preferred modes. Tester has notifications (Push, SMS, and Email) toggled on.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on "Where To?" and enter a destination in Columbus, OH. 2. Click on a trip option which has ride-hail and COTA as modes of transportation. 3. Select 'Yellow Cab' as ride-hail option. 4. Click "Start" to begin the trip. 5. A pop-up appears on the screen to confirm the taxi order. Click 'OK' to confirm. 6. Walk to the ride-hail pickup location. 7. Taxi arrives at the location. Confirm the car number. 8. Take the yellow cab and reach the next trip segment. 9. Verify Pivot app provide notifications alerting of the next ride timings. 10. Walk to the COTA bus stop. Note the bus number from the Pivot trip details. 11. Take the COTA bus to the next trip segment. 12. Verify Pivot app provides notifications alerting of the next trip segment. 13. Walk to the destination. 14. Click 'End' to end the trip within the Pivot app. 15. A popup to provide feedback will be prompted on the screen once the trip is completed. 16. Enter rating and click 'Ok" <p><u>Pass criteria:</u> Verification by two independent testers on Android and iOS devices. Tester can book a trip and receive notifications of when the service will arrive. Tester can complete a trip and provide feedback on each segment and overall trip experience.</p> <p><u>Post-condition:</u></p>	Traveler II	10/20/2020 – 10/23/2020	Passed	[10/20 – 10/23] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRB021-V01	To demonstrate the ability to notify users of increased travel time and alternate routes and/or modes	Trip Changes	Travelers are notified of increased travel time and suggested other routes and/or modes.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in. Tester has selected Transit as the only preferred modes. Tester has notifications (Push, SMS, and Email) toggled on.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Enter an origin and destination address to begin trip search 2. Book a trip 3. Ensure the trip will have an increased travel time (https://www.cota.com/rider-service-alerts/) 4. Verify that the user is warned of the increased travel time in advance 5. Verify that the user is suggested other routes and/or modes <p><u>Pass criteria:</u> Verification by two independent testers on Android and iOS devices. Travelers should be warned of increased travel time and suggested other routes and/or modes.</p> <p><u>Post-condition:</u></p>	Traveler II	10/20/2020 – 10/23/2020	Passed	[10/20 – 10/23] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRB022-V01	To allow user to make changes to an existing trip.	Trip Changes	<p>Traveler can make changes to an existing trip and cancel the scheduled trip.</p> <p>---</p> <p>Mobility providers are notified of changes to an existing reservation.</p>	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on "Where To?" and enter a destination in Columbus, OH that is accessible by Taxi from your current location. 2. Press "Leave At" and change the start time of the trip to occur two hours from now. 3. Press "Book" to book the trip. 4. Review the scheduled trip showing the trip departure date/time, and from/to locations. A pop-up appears on the screen to confirm the taxi order. Click 'OK' to confirm. 5. Click on the red "x" to cancel the trip. 6. Press "Yes" when prompted to confirm you want to cancel the trip. 7. Verify that the scheduled trip has been canceled. <p><u>Pass criteria:</u> Verification by two independent testers on Android and iOS devices. Tester can book and cancel a scheduled trip, and service provider is notified of the canceled trip. Tester should not receive an alert notifying them the trip is about to start.</p> <p><u>Post-condition:</u> Trip has been canceled; service provider has been notified of canceled trip.</p>	Traveler II	10/20/2020 – 10/23/2020	Passed	[10/20 – 10/23] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-TRB023-V01	To demonstrate trip metrics in the Metrics section of the Pivot app.	Metrics	Trip metrics are updated in the Metrics section of the Pivot app.	<p><u>Pre-condition:</u> Pivot is open; tester has completed the steps above to complete a trip; 24 hours have elapsed since the completed trip.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the menu button (three bars icon) at the top left of the screen and click "Test Metrics". 2. Review updates to the bus and ride-hail trip metrics. <p><u>Pass criteria:</u> Trip metrics have updated in the past 24 hours for the trip taken.</p> <p><u>Post-condition:</u> Tester will only see gallons saved, exercise, and bus metrics if modes other than car are selected.</p>	Traveler II	10/20/2020 – 10/23/2020	Passed	[10/20 – 10/23] Passed.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-GOH001-V01	To demonstrate the ability to book trips in accordance with the policies of the Gohio Commute app.	Planning and Booking	User can book a carpool trip in accordance with the policies of the Gohio Commute app.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in; Gohio account not setup.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. User goes to gohiocommute.com on his or her computer or smartphone. 2. User clicks register to begin account setup and completes the necessary information to complete the setup. 3. Once account is setup, User needs to enter commute information (origin and destination, working hours, etc.) and preferences (driver, passengers, etc.) in the app. 4. User opens Pivot app. 5. User clicks on menu button (three lines in upper left) and click 'Connect Accounts'. 6. User clicks Gohio and enters username and password to connect account with Pivot. 7. User clicks the Scheduled Trips icon (calendar in upper right) to access planned trips. 8. To initiate an upcoming trip, the User clicks the 'Thumbs Up' button and selects if the User will be Solo, Driver, or Rider. For the test, one User will select Rider and on User will select Driver. 9. The User that is a Rider needs to select 'Thumbs Up' as well to initiate the pickup. 10. Pivot will alert the Driver when it is time to depart. The User will click on the notification to launch navigation to the see the trip plan, in order of passenger pickup. 11. Pivot will alert the Rider when the Driver is arriving. 12. The navigation will take the Driver to the Rider's pickup location and to the destination. <p><u>Pass criteria:</u> Verification by two independent testers on Android and iOS devices.</p> <p><u>Post-condition:</u> Rider and Driver successfully arrive at their destination.</p>	Traveler II – Gohio	11/18 11/19	Failed Deferred	[11/18] Failed. [11/19] Gohio Commute testing has been deferred until March 2021, due to integration with a custom API.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-GOH002-V01	To demonstrate the connection to the Gohio Commute application for carpool	Ridesharing Providers	User can see turn by turn directions based on passenger response with quickest route available.	<p><u>Pre-condition:</u> User has an active Gohio Commute account and is a part of an active carpool. User is logged in to Gohio Commute through connected accounts into Pivot. For this test, other travelers in the same carpool must notify the "driver" if they are participating in the carpool through the Pivot app.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. User can see carpool trips and travelers in the Scheduled Trips section. 2. User will specify that he/she is the driver. 3. User will record that he/she is participating in the carpool by clicking the thumbs up. 4. User will see notification of selection. 5. User will launch navigation to see the trip plan, in order of passenger pick up. <p><u>Pass criteria:</u> Verification by two independent testers on Android and iOS devices. User can see turn by turn directions based on passenger response with quickest route available.</p> <p><u>Post-condition:</u> Driver will have picked up passengers in order that is presented, and that order is optimal for the overall drive.</p>	Traveler II – Gohio	11/18	Passed	<p>[11/18] Passed.</p> <p>Did the trip you set up in Gohio Commute show in the Scheduled Trips in Pivot? - Yes (both testers)</p> <p>Driver - did Pivot provide the best route to pick up your rider? - There is a quicker way, but it involves side streets. The way that was presented by Pivot is what Google Maps initially suggests so it may be a matter of the algorithm avoiding side streets. Still a pass in my opinion.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-GOH003-V01	To demonstrate the connection to the Gohio Commute application for carpool	Ridesharing Providers	-	<p><u>Pre-condition:</u> User has active Gohio Commute account and is a part of an active carpool. User is logged in to Gohio Commute through connected accounts into Pivot. For this test, other users in the same carpool must notify the "driver" if they are participating in the carpool through the Pivot app.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. User can see carpool trips and travelers in the Scheduled Trips section. 2. User will specify that she is the driver. 3. User will record that she is participating in the carpool by clicking the thumbs up. 4. User will see notification of selection. 5. User will launch navigation to see the trip plan, in order of passenger pick up. <p><u>Pass criteria:</u> Verification by two independent testers on Android and iOS devices. User can see turn by turn directions based on passenger response with quickest route available.</p> <p><u>Post-condition:</u></p>	Traveler II – Gohio	11/18	Passed	Same comments as MMTPA-GOH002-V01. [11/18] Passed.

Source: City of Columbus

3.2. PIVOT KIOSK TEST RESULTS

Error! Reference source not found. provides a results matrix of the results of testing the Pivot kiosk functionality. For each test case, test status is logged either as passed, failed, cancelled or deferred. All the test cases marked as deferred, failed or cancelled are tracked by defect management tool shown in **Table 5**. Relevant notes from the testers are included in the Test Comments column with references to defects or change requests in **Chapter 5**. Test cases that were regression tested or deferred to a different date will have multiple entries in Date Run and Test Status column.

Table 3: Pivot Kiosk Test Results Matrix

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-SMH001-V01	To demonstrate trip planning at a SMH kiosk using pivot app and receive the trip planning by text or email	Smart Mobility Hubs	Travelers can plan a trip at a Smart Columbus kiosk.	<p><u>Pre-condition:</u> Tester has a smart phone and access to the Pivot app through the IK.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Open Pivot app on the IK. 2. Click 'Where to' to enter destination. 3. Select a trip option from displayed options and click 'Book'. 4. Enter email or phone number to access trip information on the smart phone. 5. Enter the confirmation code sent to the smartphone (phone or text). 6. A link is sent to the smartphone either as a text or email based on the option chosen. 7. Click on the link to access trip information selected on the IK. 8. Tester will be prompted to download the Pivot from the app or play store (if not downloaded) OR Pivot is launched with the trip plan. <p><u>Pass criteria:</u> Verification by two independent testers at two different SMH kiosks: User can launch the Pivot app and selected trip plan is shown on the app using the link</p> <p><u>Post-condition:</u> N/A</p>	Traveler II – Kiosk	10/13/2020 12/8/2020 1/7/2021 1/22/2021	Failed Passed In Progress Passed	<p>[10/13] The link only sends to the Play Store and doesn't not populate in Pivot when opening.</p> <p>[12/8] All trip plans were able to be accessed by entering in the wrong Confirmation Code.</p> <p>[1/7] Pass for testers at Northern Lights. Did not test at another location and need two more testers to test this one.</p> <p>[1/22] Passed.</p> <p>Defect MMTPA-SMH-DEF005 logged and closed.</p> <p>Defect MMTPA-APP-DEF012 logged and resolved.</p> <p>Defect MMTPA-APP-DEF013 logged and resolved.</p>
MMTPA-SMH002-V01	To demonstrate SMH location, trip data and timestamp data are sent to OS.	Smart Mobility Hubs	SMH location, trip data and timestamp data are sent to OS for each IK.	<p><u>Pre-condition:</u> Tester has completed trip on the IK.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Verify that data are present in the OS <p><u>Pass criteria:</u> Data are sent to the OS for each IK.</p> <p><u>Post-condition:</u> N/A</p>	Technical	1/7/2021 1/22/2021	Deferred Passed	<p>[1/22] Passed.</p> <p>https://discovery.smartcolumbus.com/dataset/pivot/smart_mobility_hub_trips_planned_via_kiosk</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-SMH003-V01	To demonstrate user must enter the correct verification code in order to receive trip plan	Smart Mobility Hubs	Traveler must provide a correct verification code in order to receive trip plan.	<p><u>Pre-condition:</u> Tester has a smart phone and access to the Pivot app through the IK.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Open Pivot app on the IK. 2. Click 'Where to' to enter destination. 3. Select a trip option from displayed options and click 'Book'. 4. Enter email or phone number to access trip information on the smart phone. 5. When prompted to verify your identity, enter an incorrect Pivot verification code (not the correct code that was sent to you via text or email) 6. Confirm message "Incorrect code. Please try again." 7. Enter the correct Pivot verification code 8. Verify receipt of trip plan (via text or email) 9. Verify the Pivot app on the IK is reset after 10 seconds of verification <p><u>Pass criteria:</u> Verification by two independent testers at two different SMH kiosks: User must enter the correct Pivot verification in order to receive trip plan.</p> <p><u>Post-condition:</u> N/A</p>	Traveler II – Kiosk	1/7/2021 1/22/2021	In progress Passed	<p>[1/22] Passed.</p> <p>If an incorrect code of 6 digits is entered, this passes.</p> <p>If an incorrect code of 7 digits is entered, because more digits may be entered, no error message appears. The screen just stays the same until the correct code is entered.</p> <p>Need to scroll to see the entire email when entering your email.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-SMH004-V01	To demonstrate user can successfully end a trip.	Smart Mobility Hubs	Traveler can cancel a trip received from the kiosk.	<p><u>Pre-condition:</u> Tester has a smart phone and access to the Pivot app through the IK.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Open Pivot app on the IK. 2. Plan a trip and send trip plan to your phone to complete the verification process. 3. Locate trip in the scheduled trips tab 4. Cancel the trip. <p><u>Pass criteria:</u> Verification by two independent testers at two different SMH kiosks: Tester can cancel a trip sent from the IK to the smartphone. Tester does not experience a forced app closure when attempting to end the trip.</p> <p><u>Post-condition:</u> N/A</p>	Traveler II – Kiosk	1/7/2021 1/22/2021	In progress Passed	<p>[1/22] Passed.</p> <p>Trips don't show up in scheduled trips until you click on start for the trip.</p> <p>After clicking on start, the trip shows up in scheduled trips.</p> <p>NOTE: When there are no trips in the scheduled trips section, it tells the user to press BOOK. But the user never presses book in the app, they only press Start for a trip.</p> <p>Defect MMTPA-SMH-DEF001 logged and closed.</p>
MMTPA-SMH005-V01	To provide user with instructions for use of the app and educational material pertaining to each mode of service.	Educational Material	Instructions for using the Pivot app are accessible and up to date.	<p><u>Pre-condition:</u> Tester has access to Pivot app on IK.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the menu button (three bars icon) at the top left of the screen and click "Help". 2. Click the "Show Me" button. 3. Review the instructions. 4. Verify the instructions aid in general understanding of the app and provide information relevant to each functionality and mode of service provided in the app. <p><u>Pass criteria:</u> Verification by at least two independent testers at two different SMH kiosks: Instructions are presented to the user to assist in general understanding of the app.</p> <p><u>Post-condition:</u> N/A</p>	Traveler II – Kiosk	1/7/2021 1/22/2021	Failed Passed	<p>[1/7] Nothing happened when the question mark icon was pressed. Help section was not presented. Maybe since the help section being presented in a new tab on the web.</p> <p>[1/22] Passed.</p> <p>Defect MMTPA-SMH-DEF002 logged and resolved.</p> <p>Defect MMTPA-SMH-DEF007 logged and resolved.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-SMH006-V01	To incorporate individual preference for mode/service in search results	User Preferences	Trip itineraries are created in accordance with user preference for mode/service.	<p><u>Pre-condition:</u> Tester has access to Pivot app on IK.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Select "Preferred Modes" option. 3. Select a mode(s) that was not previously selected. 4. Return to the previous screen by selecting the left arrow. 5. Confirm the number of selected modes has updated. 6. Exit settings panel. 7. Plan a trip that includes the new mode in the trip search results. 8. Verify that the new mode is included in the trip search results. <p><u>Pass criteria:</u> Verification by at least two independent testers at two different SMH kiosks: Preferred mode/service is reflected in the trip search results.</p> <p><u>Post-condition:</u> Settings panel is closed; preferred modes are updated.</p>	Traveler II – Kiosk	1/7/2021 1/22/2021	Failed Passed	<p>[1/7] Turned bus off and had ride-hail and personal bike turned on. Bus still showed up in the options.</p> <p>[1/22] Passed.</p> <p>Defect MMTPA-SMH-DEF003 logged and resolved.</p> <p>Defect MMTPA-SMH-DEF006 logged and resolved.</p> <p>Defect MMTPA-SMH-DEF008 logged and resolved.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-SMH007-V01	To incorporate individual preference for maximum total cost in search results	User Preferences	Trip itineraries are created in accordance with user preference for max cost.	<p><u>Pre-condition:</u> Tester has access to Pivot app on IK.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Press the dollar amount next to "Max Cost Per Trip." 3. Use the slider to change the amount, then press "Apply." 4. Confirm that the dollar amount displayed next to "Max Cost Per Trip" changed to the selected amount. 5. Exit the setting panel. 6. Plan a trip. 7. Verify that the max cost of the trip search results did not exceed the amount set under settings. <p><u>Pass criteria:</u> Verification by at least two independent testers at two different SMH kiosks: Max cost per trip is reflected in the trip search results.</p> <p><u>Post-condition:</u> Settings panel is closed; preferred modes are updated.</p>	Traveler II – Kiosk	1/7/2021 1/22/2021	Failed Passed	<p>[1/7] Testers planned a trip and after seeing the original trip costs, they set their max trip cost lower and those original options were still available. Trips were ride-hail.</p> <p>[1/22] Passed. Make sure more than just bus mode is selected.</p> <p>Defect MMTPA-SMH-DEF004 logged and resolved.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-SMH008-V01	To incorporate individual preference for maximum number of trip segments in search results	User Preferences	Trip itineraries are created in accordance with user preference for max transfers.	<p><u>Pre-condition:</u> Tester has access to Pivot app on IK.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Press the number next to "Max Transfers." 3. Use the slider to change the number, then press "Apply." 4. Confirm that the number displayed next to "Max Transfers" changed to the selected amount. 5. Exit the settings panel. 6. Plan a trip. 7. Verify that the max transfers amount is reflected in the trip search results (for example, search results now show a max of two transfers, whereas before, results showed three). <p><u>Pass criteria:</u> Verification by at least two independent testers at two different SMH kiosks: Max transfers is reflected in the trip search results.</p> <p><u>Post-condition:</u> Settings panel is closed; preferred modes are updated.</p>	Traveler II – Kiosk	1/7/2021 1/22/2021	Failed Passed	<p>[1/7] Scheduled trips and options showed more than the max transfers listed in preferences. Would prefer the Transfers line in preferences, denote "bus" transfers like the app. [1/22] Passed. During this test, one tester removed everything but busses to test transfers and ride-hail continue to show up as an option. It was a ride-hail only option that appeared. Other mode trip options were provided even without selecting those modes in preferences.</p> <p>Defect MMTPA-SMH-DEF019 logged and in progress.</p>
MMTPA-SMH009-V01	To filter search results by cheapest or quickest route	User Preferences	Trip itineraries are ordered in accordance with user preference for cheapest or quickest route.	<p><u>Pre-condition:</u> Tester has access to Pivot app on IK.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Enter an origin and destination to search for a trip. 2. Click "suggest" next to sort. 3. Select desired sorting option, either cheapest or quickest. <p><u>Pass criteria:</u> Verification by at least two independent testers at two different SMH kiosks: Results are sorted in order of cheapest or quickest route.</p> <p><u>Post-condition:</u> N/A</p>	Traveler II – Kiosk	1/7/2021 1/22/2021	In progress Passed	<p>[1/7] Need to test since the COTA fares are collected starting 1/11/2021. App is still showing \$0 for bus fares. [1/22] Passed.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-SMH010-V01	To incorporate individual preference for maximum walking distance in search results	User Preferences	Trip itineraries are created in accordance with user preference for max walking distance.	<p><u>Pre-condition:</u> Tester has access to Pivot app on IK.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Press the number next to "Max Walking Distance." 3. Change the number, then press "Apply." 4. Confirm that the number displayed next to "Max Walking Distance" changed to the selected amount. 5. Exit the settings panel. 6. Plan a trip. 7. Verify that the max walking distance is reflected in the trip search results (for example, search results now show an increase or decrease in walking distance for the walking portion of the trip). <p><u>Pass criteria:</u> Verification by at least two independent testers at two different SMH kiosks: User's preferred maximum walking distance is updated and displayed in the trip itinerary. Note: If user selects a walking distance of 0, results will be returned with a minimum walk distance necessary to get to mode.</p> <p><u>Post-condition:</u> Settings panel is closed; preferred modes are updated.</p>	Traveler II – Kiosk	1/7/2021 1/22/2021	Failed Passed	<p>[1/7] Trip plans provided had more walking distance than the distance specified in the settings.</p> <p>[1/22] Max walking distance was set to .25 for testers and trip options given were a farther walk.</p> <p>Trip Plans we used: Northern Lights to Linden McKinley High School. Northern Lights to City Hall. Northern Lights to Cremeans Park.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-SMH011-V01	To incorporate individual preference for accessible vehicle in search results that includes ride hailing	User Preferences	Trip itineraries exclude non-accessible vehicles.	<p><u>Pre-condition:</u> Tester has access to Pivot app on IK.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Toggle on "Wheelchair Accessibility" to turn on the option. (Note: you can also click on the preferred modes in the settings to see which modes are active.) 3. Plan a trip to a destination. 4. Verify a non-ADA vehicle (e.g., scooter) is not presented. 5. Select a trip with ride hail (taxi). 6. Verify the vehicle that arrives can accommodate a wheelchair passenger. <p><u>Pass criteria:</u> Verification by at least two independent testers at two different SMH kiosks: Modes presented meet the disability requirements and the vehicle that arrives can accommodate those requirements.</p> <p><u>Post-condition:</u> An accessible vehicle arrives.</p>	Traveler II – Kiosk	1/7/2021 1/22/2021	Failed Passed	<p>[1/7] When turning the ADA preference on, all modes are still available and walk, bus and ride-hail are turned on. When scheduling a trip with ADA selected, ride-hail is the only option that shows up – bus options are not presented. [1/22] Passed.</p> <p>Defect MMTPA-SMH-DEF009 logged and resolved.</p> <p>Defect MMTPA-APP-DEF003 logged and in progress.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-SMH012-V01	To incorporate individual preference for accessible vehicle in search results that includes COTA bus service	User Preferences	Trip itineraries exclude non-ADA vehicles.	<p><u>Pre-condition:</u> Tester has access to Pivot app on IK; tester has wheelchair-accessible option active in preferences.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Toggle on "Wheelchair Accessibility" to turn on the option. 3. Plan a trip to a destination. 4. Verify a non-ADA vehicle (e.g., scooter) is not presented. 5. Select a trip with COTA. 6. Verify the vehicle that arrives can accommodate a wheelchair passenger. <p><u>Pass criteria:</u> Verification by at least two independent testers at two different SMH kiosks: Modes presented meet the disability requirements and the vehicle that arrives can accommodate those requirements.</p> <p><u>Post-condition:</u> An accessible vehicle arrives.</p>	Traveler II – Kiosk	1/7/2021 1/22/2021	Failed Passed	<p>[1/7] Bus options are not presented with ADA turned on.</p> <p>[1/22] Passed.</p> <p>Defect MMTPA-SMH-DEF010 logged and resolved.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-SMH013-V01	To incorporate individual preference for accessible vehicle in search results	User Preferences	Trip itineraries exclude non-ADA modes.	<p><u>Pre-condition:</u> Tester has access to Pivot app on IK.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen. 2. Press the switch next to "Wheelchair Accessible" to enable this option. 3. Verify in the preferences that the options are wheelchair accessible and that other modes (e.g., scooters) have been removed. <p><u>Pass criteria:</u> Verification by at least two independent testers at two different SMH kiosks: The options presented to the user can accommodate wheelchairs. The options presented are walking (or rolling), car, public transit, and ride hail. Scooter and bike are not shown.</p> <p><u>Post-condition:</u> The results presented are wheelchair accessible.</p>	Traveler II – Kiosk	1/7/2021 1/22/2021	Failed Passed	<p>[1/7] Other modes have not been removed when switching to wheelchair accessible. Prefer to have same UI and functionality for ADA for web as it works in the app. [1/22] Passed.</p> <p>Defect MMTPA-SMH-DEF011 logged and resolved.</p>
MMTPA-SMH014-V01	To filter search results by environmental impact or "greenest" trip	User Preferences	Trip itineraries can be sorted by "eco-friendly".	<p><u>Pre-condition:</u> Tester has access to Pivot app on IK.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Enter an origin and destination to search for a trip. 2. Click "suggest" (next to sort). 3. Select "Eco-Friendly." 4. Verify results. <p><u>Pass criteria:</u> Verification by at least two independent testers at two different SMH kiosks: User's preferred sorting method changed. Travel options updated to match this choice.</p> <p><u>Post-condition:</u> N/A</p>	Traveler II – Kiosk	1/7/2021 1/22/2021	Failed Passed	<p>[1/7] Eco-friendly only works without using personal bike as an option since personal bike for the whole trip would have been the most eco-friendly option. [1/22] Passed.</p> <p>Defect MMTPA-SMH-DEF012 logged and closed.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-SMH015-V01	To successfully search for a scooter based on user's location.	Rides-Near-Me	A list of scooter locations is presented to the traveler.	<p><u>Pre-condition:</u> Tester has access to Pivot app on IK.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Review ride options on the map. 2. Verify that rides appear by mode, by color, with mobility provider identified on the list. 3. Click on a mode to zoom to the location of selected ride. <p><u>Pass criteria:</u> Verification by at least two independent testers at two different SMH kiosks: Nearby scooter options are shown in the list; clicking on the ride updates the map with the location of the mode.</p> <p><u>Post-condition:</u> N/A</p>	Traveler II – Kiosk	1/7/2021 1/22/2021	In progress Passed	<p>[1/7] No rentals button to click on because it is different than app.</p> <p>Instead tested by clicking on bike and scooter logos. Lime logo is missing and making the word Lime show up twice.</p> <p>[1/22] Passed.</p> <p>Add Spin to preferred modes since it appears in the map as an option.</p>
MMTPA-SMH016-V01	To successfully search for a bike based on user's location.	Rides-Near-Me	A list of bike locations is presented to the traveler.	<p><u>Pre-condition:</u> Tester has access to Pivot app on IK.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Review ride options on the map. 2. Verify that rides appear by mode, by color, with mobility provider identified on the list. 3. Click on interactive list to zoom to the location of selected ride. <p><u>Pass criteria:</u> Verification by at least two independent testers at two different SMH kiosks: Nearby bike options are shown in the list; clicking on the ride updates the map with the location of the mode.</p> <p><u>Post-condition:</u> N/A</p>	Traveler II – Kiosk	1/7/2021 1/22/2021	In progress Passed	<p>[1/7] No rentals button to click on because it is different than app.</p> <p>Bike icons appear and CoGo logo is fine. Need to test at a location with bikeshare.</p> <p>[1/22] Passed.</p>

MMTPA-SMH017-V01	To demonstrate that the GUI allows for effective use of the application	User Interface	The GUI is intuitive and easy to use, and allows for effective use of the Pivot app.	<p><u>Pre-condition:</u> Tester has access to Pivot app on IK.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Verify that GUI elements such as map, text, icons, and font are organized to be intuitive and easy to understand to allow for effective use of the application. 2. Confirm the ability to navigate between screens without loss of data or having to start over. 3. Confirm that the GUI elements appear professional and exhibit a consistent "look and feel." <p><u>Pass criteria:</u> Verification by at least two independent testers at two different SMH kiosks: The app provides a GUI that passes basic tests for effective use.</p> <p><u>Post-condition:</u> N/A</p>	Traveler II – Kiosk	1/7/2021 1/22/2021	Failed Passed	<p>[1/7] See picture of backspace issue. When trying to backspace to delete the already entered where to location. As shown in the picture other alphabets appeared on the bar and were not able to backspace those characters.</p> <p>Copy or copy paste options would occasionally pop-up on screen</p> <p>Background map keeps moving when we try to close screens or options/preferences. Don't know a safe place to click to close anything.</p> <p>Prefer to have all modes turned on except personal bike and car when the Kiosk app is opened.</p> <p>Map location pop-up happens when touching the map area to try to close out different portions of the app.</p> <p>No north arrow.</p> <p>Map has a 3D image rotation feature without an undo feature.</p> <p>[1/22] Users now have a spot to enter in current location. If you accidentally touch that box, it removes current location then you have no way to get back to current location.</p> <p>Add a current location feature for the kiosks or a button to hit to add in current location.</p> <p>Defect MMTPA-SMH-DEF013 logged and closed.</p> <p>Defect MMTPA-SMH-DEF014 logged and in progress.</p> <p>Defect MMTPA-SMH-DEF015 logged and resolved.</p>
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TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
								Defect MMTPA-SMH-DEF016 logged and resolved. Defect MMTPA-SMH-DEF017 logged and resolved.
MMTPA-SMH018-V01	To demonstrate ability to set preferred language in the app	Languages	Travelers can select English or Spanish as the display language in Pivot.	<p><u>Pre-condition:</u> Tester has access to Pivot app on IK.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Press the gear at the top right of the screen. 2. Press 'English' under display language option. 3. Change the desired language to Spanish. 4. Verify the display language updates to Spanish. <p><u>Pass criteria:</u> Verification by at least two independent testers at two different SMH kiosks: The display language shows the selected language. The text updates to the selected language.</p> <p><u>Post-condition:</u> App displays text in Spanish.</p>	Traveler II – Kiosk	1/7/2021 1/22/2021	Failed Passed	[1/7] Same sections do not convert to Spanish as the website. [1/22] Passed. Defect MMTPA-SMH-DEF018 logged and resolved.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-SMH019-V01	To demonstrate access to training and educational material in user's preferred language - Spanish	Languages	Travelers can view education material in either English or Spanish.	<p><u>Pre-condition:</u> Tester has access to Pivot app on IK.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Press the gear at the top right of the screen. 2. Press 'English' under display language option. 3. Change the desired language to Spanish. 4. Verify the display language updates to Spanish. 5. Go back to the home page of the app. 6. Press the menu button (three bars icon) at top left of screen. 7. Press "Ayuda". 8. Click "Muéstrame". 9. Verify that the help site is displayed in Spanish. <p><u>Pass criteria:</u> Verification by at least two independent testers at two different SMH kiosks: The help site is displayed in Spanish.</p> <p><u>Post-condition:</u> The app remains open in the background as the help site opens.</p>	Traveler II – Kiosk	1/7/2021 1/22/2021	Failed Passed	[1/7] Help icon is not working. [1/22] Passed.

Source: City of Columbus

3.3. PIVOT WEB PORTAL TEST RESULTS

Error! Reference source not found. provides a results matrix of the results of testing the Pivot web portal. For each test case, test status is logged either as passed, failed, cancelled or deferred. All the test cases marked as deferred, failed or cancelled are tracked by defect management tool shown in **Table 5**. Relevant notes from the testers are included in the Test Comments column with references to defects or change requests in **Chapter 5**. Test cases that were regression tested or deferred to a different date will have multiple entries in Date Run and Test Status column.

Table 4: Pivot Web Portal Test Results Matrix

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-WEB001-V01	To demonstrate trip planning in the Pivot web portal and receive the trip planning by text or email	Pivot web portal	Travelers can plan a trip using the Pivot web portal.	<p><u>Pre-condition:</u> Tester has access to the web portal using latest version of Google Chrome, Apple Safari, or Microsoft Edge.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Open the Pivot web portal. 2. Click 'Where to' to enter destination. 3. Select a trip option from displayed options and click 'Book'. 4. Enter email or phone number to access trip information on the smart phone. 5. Enter the confirmation code sent to the smartphone (phone or text). 6. A link is sent to the smartphone either as a text or email based on the option chosen. 7. Click on the link to access trip information selected on the web portal. 8. Tester will be prompted to download the Pivot from the app or play store (if not downloaded) OR Pivot is launched. 9. Tester will be prompted to login to the app to access the trip plan. 10. Trip plan is provided after logging in. <p><u>Pass criteria:</u> Verification by three independent testers using Google Chrome, Apple Safari, and Microsoft Edge web browsers: User can search the web portal for a trip and launch the Pivot app with the selection trip plan.</p> <p><u>Post-condition:</u> N/A</p>	Traveler II – Web	12/8/2020 1/6 to 1/11 1/19/2021	Failed In progress Passed	<p>[12/8] Under settings, I can change the bus transfers, walking distance or trip cost but cannot click 'Apply'. Couldn't see whole screen of travel alerts or preferred modes setting when at regular zoom (100%). Preferred modes screen jumps from right to left when trying to close the settings window by clicking on the map. Suggestion – limit scooters and bikes shown on the screen to only show like a mile radius from the users current or selected location. Whenever clicked on the map to exit other windows or to even scroll the map, the curser adds a pin saying to get directions from the clicked location. [1/6] A new account was created and forgot password action was taken. Since then not able to login with the new account. [1/7] Was able to login with the new account and changed password. After logging in on the app, a blue screen comes up and is stuck. Screenshot attached. Could not get the trip plan even after multiple attempts. Killed in the background. This time tried to log in on the app without clicking on the trip link and cannot pass through the blue screen. [1/8] Same issue as above. [1/11] Same issue as above. [1/19] Passed.</p> <p>Defect MMTPA-WEB-DEF007 logged and closed.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-WEB002-V01	To demonstrate location, trip data and timestamp data are sent to OS.	Pivot web portal	Location, trip data and timestamp data are sent to OS.	<p><u>Pre-condition:</u> Tester has completed trip using the Pivot web portal.</p> <p><u>Steps:</u> 1. Verify that data are present in the OS</p> <p><u>Pass criteria:</u> Data are sent to the OS for trip created using the Pivot web portal.</p> <p><u>Post-condition:</u> N/A</p>	Technical	12/11/2020	Deferred	Data will not be sent to the OS until the Pivot web portal is live.
MMTPA-WEB003-V01	To provide user with instructions for use of the pivot web and set preferences.	Educational Material	Instructions for using the Pivot app are accessible and up to date.	<p><u>Pre-condition:</u> Pivot web portal is open; tester does not have an account.</p> <p><u>Steps:</u> 1. Click on the "?" button located at the left side panel of the screen. 2. A new webpage will open with the instructions. 3. Verify the instructions aid in general understanding of the app and provide information relevant to selecting preferences and sending trip information to mobile.</p> <p><u>Pass criteria:</u> Verification by at least four independent testers: Instructions are presented to the user to assist in general understanding of the Pivot web portal.</p> <p><u>Post-condition:</u> N/A</p>	Traveler II – Web	1/6/2021	Passed	[1/6] Remove trip metrics and use same format as Pivot app help.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-WEB004-V01	To successfully register a new Pivot account and verify user identity through process of two-factor authentication.	Register Account	Tester can complete multi-factor authentication to register a new account.	<p><u>Pre-condition:</u> Pivot web portal is open; tester does not have an account.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click the 'human' button located at the left side panel of the screen. 2. Click "SIGN UP." 3. Enter First Name, Last Name, Phone, Email Address, and Password (2x). 4. Press "Next." 5. Confirm your registration by selecting to receive a verification code via phone 6. Enter the 6-digit verification code in the app and press "Confirm" 7. Verify that registration completed successfully and click on the "Continue" button to be brought back to the map. 8. Click the 'human' button located at the left side panel of the screen to verify that you are logged into the app. 9. Click on "View Profile" to verify your account information. 10. Change your profile information and click on the "Update" button 11. Close and reopen the app to verify that your profile information has been updated <p><u>Pass criteria:</u> Verification by at least four independent testers: Tester has created an account and is logged in. Tester can access and update profile information.</p> <p><u>Post-condition:</u> Registration is complete; tester is logged in.</p>	Traveler II – Web	1/6/2021 1/19/2021	In progress Passed	<p>[1/6] When trying to register with same account (email address), first gave an error that user already exists for two seconds and then the error is gone but register button keeps spinning.</p> <p>Refreshed the page to entered new email address.</p> <p>[1/19] Passed.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-WEB005-V01	To demonstrate the ability for a user to reset his/her password if forgotten.	Recover password	Tester can recover password.	<p><u>Pre-condition:</u> Pivot web portal is open.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Open log in screen to type in email address associated with account. 2. Click the forgot password button to confirm email address. 3. Open email and click link to reset password. 4. Confirm password is valid by logging into Pivot. <p><u>Pass criteria:</u> Verification by at least four independent testers: Tester can change password through Pivot web portal with confirmation email.</p> <p><u>Post-condition:</u> Tester is logged in.</p>	Traveler II – Web	1/6/2021 1/19/2021	Failed Passed	<p>[1/6] When entered wrong code, no error is presented to the user but also did not go through the next page.</p> <p>Cannot login to any of the accounts that are created on web or on app once the password is reset. When trying to login with new password, error is presented, Screenshot attached, and cannot login. Errors presented include 'Error Updating Token' and Cannot set property 'accessToken' of undefined. Screenshots attached.</p> <p>Email subject – Pivot Trip Code and the text is Pivot verification code. Screenshot attached.</p> <p>[1/19] Passed.</p> <p>Defect MMTPA-WEB-DEF001 logged and resolved.</p> <p>Defect MMTPA-WEB- DEF010 logged and resolved.</p> <p>Defect MMTPA-WEB- DEF011 logged and resolved.</p> <p>Defect MMTPA-WEB- DEF020 logged and resolved.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-WEB006-V01	To incorporate individual preference for mode/service in search results	User Preferences	Trip itineraries are created in accordance with user preference for mode/service.	<p><u>Pre-condition:</u> Pivot web portal is open, and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Select "Preferred Modes" option. 3. Select a mode(s) that was not previously selected. 4. Exit the window by clicking on the screen. 5. Open "Preferred Modes" window again to confirm the number of selected modes has updated. 6. Exit settings panel. 7. Plan a trip that includes the new mode in the trip search results. 8. Verify that the new mode is included in the trip search results. <p><u>Pass criteria:</u> Verification by at least four independent testers: Preferred mode/service is reflected in the trip search results.</p> <p><u>Post-condition:</u> Settings panel is closed; preferred modes are updated.</p>	Traveler II – Web	1/9/2021 1/19/2021	In progress Passed	<p>[1/9] Ohio Union to Bolz hall. First attempt scooters and bikes weren't given as trip option even though those were selected. Got stuck on the where to screen and went back by click on the back arrow. Had to refresh. Second and third attempt: Could only enter 'where to' option. No current location was given Fourth refresh: removed bus and then options for scooter were presented. Fifth attempt: same as first. Only bus options even with Scooter and bike turned on. When Public Transit is turned off that when the scooter options are provided. No ride-hail options were provided even though selected. To compare ran the same locations on the app and scooter and ride-hailing options were provided unlike web. [1/19] Passed.</p> <p>Defect MMTPA-WEB-DEF002 logged and resolved.</p> <p>Defect MMTPA-WEB- DEF019 logged and resolved.</p> <p>Defect MMTPA-WEB- DEF021 logged and resolved.</p> <p>Defect MMTPA-WEB- DEF022 logged and resolved.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-WEB007-V01	To incorporate individual preference for maximum total cost in search results	User Preferences	Trip itineraries are created in accordance with user preference for max cost.	<p><u>Pre-condition:</u> Pivot is open and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Press the dollar amount next to "Max Cost Per Trip." 3. Use the slider to change the amount, then press "Apply." 4. Confirm that the dollar amount displayed next to "Max Cost Per Trip" changed to the selected amount. 5. Exit the setting panel. 6. Plan a trip. 7. Verify that the max cost of the trip search results did not exceed the amount set under settings. <p><u>Pass criteria:</u> Verification by at least four independent testers: Max cost per trip is reflected in the trip search results.</p> <p><u>Post-condition:</u> Settings panel is closed; preferred modes are updated.</p>	Traveler II – Web	1/6/2021 1/19/2021	Failed Passed	<p>[1/6] Trips shown are more than the max trip cost. When changed the trip cost, all the options are still shown and doesn't reflect the changes in the trip cost.</p> <p>[1/19] Passed.</p> <p>Defect MMTPA-WEB-DEF003 logged and closed.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-WEB008-V01	To incorporate individual preference for maximum number of trip segments in search results	User Preferences	Trip itineraries are created in accordance with user preference for max transfers.	<p><u>Pre-condition:</u> Pivot web portal is open, and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Press the number next to "Max Transfers." 3. Use the slider to change the number, then press "Apply." 4. Confirm that the number displayed next to "Max Transfers" changed to the selected amount. 5. Exit the settings panel. 6. Plan a trip. 7. Verify that the max transfers amount is reflected in the trip search results (for example, search results now show a max of two transfers, whereas before, results showed three). <p><u>Pass criteria:</u> Verification by at least four independent testers: Max transfers is reflected in the trip search results.</p> <p><u>Post-condition:</u> Settings panel is closed; preferred modes are updated.</p>	Traveler II – Web	1/7/2021 1/19/2021	Failed Passed	<p>[1/7] Web should say 'max bus transfers' under settings.</p> <p>The trip options showed with one bus transfers and when selected 0 bus transfers, all the options are still showing.</p> <p>[1/19] Passed.</p> <p>Defect MMTPA-WEB-DEF004 logged and closed.</p>
MMTPA-WEB009-V01	To filter search results by cheapest or quickest route	User Preferences	Trip itineraries are ordered in accordance with user preference for cheapest or quickest route.	<p><u>Pre-condition:</u> Pivot web portal is open, and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Enter an origin and destination to search for a trip. 2. Click "suggest" next to sort. 3. Select desired sorting option, either cheapest or quickest. <p><u>Pass criteria:</u> Verification by at least four independent testers: Results are sorted in order of cheapest or quickest route.</p> <p><u>Post-condition:</u> N/A</p>	Traveler II – Web	1/6/2021	Passed	<p>[1/6] When you go back from trip route page to trip results page, the sort by always default to 'Suggest' but the routes shown still are by whatever sort order is selected.</p> <p>Defect MMTPA-WEB-DEF005 logged and resolved.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-WEB010-V01	To incorporate individual preference for maximum walking distance in search results	User Preferences	Trip itineraries are created in accordance with user preference for max walking distance.	<p><u>Pre-condition:</u> Pivot web portal is open, and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Press the number next to "Max Walking Distance." 3. Change the number, then press "Apply." 4. Confirm that the number displayed next to "Max Walking Distance" changed to the selected amount. 5. Exit the settings panel. 6. Plan a trip. 7. Verify that the max walking distance is reflected in the trip search results (for example, search results now show an increase or decrease in walking distance for the walking portion of the trip). <p><u>Pass criteria:</u> Verification by at least four independent testers: User's preferred maximum walking distance is updated and displayed in the trip itinerary. Note: If user selects a walking distance of 0, results will be returned with a minimum walk distance necessary to get to mode.</p> <p><u>Post-condition:</u> Settings panel is closed; preferred modes are updated.</p>	Traveler II – Web	1/7/2021	Passed	<p>[1/7] App shows walking distance and time under trip information steps and web only shows time to walk or bike.</p> <p>Defect MMTPA-WEB-DEF006 logged and resolved.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-WEB011-V01	To incorporate individual preference for accessible vehicle in search results that includes COTA bus service	User Preferences	Trip itineraries exclude non-ADA vehicles.	<p><u>Pre-condition:</u> Pivot web portal is open, and the tester is logged in; tester has wheelchair-accessible option active in preferences.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen to open settings panel. 2. Toggle on "Wheelchair Accessibility" to turn on the option. 3. Plan a trip to a destination. 4. Verify a non-ADA vehicle (e.g., scooter) is not presented. 5. Select a trip with COTA. 6. Verify the vehicle that arrives can accommodate a wheelchair passenger. <p><u>Pass criteria:</u> Verification by at least four independent testers: Modes presented meet the disability requirements and the vehicle that arrives can accommodate those requirements.</p> <p><u>Post-condition:</u> An accessible vehicle arrives.</p>	Traveler II – Web	1/7/2021	Passed	[1/7] After refreshing, everything works.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-WEB012-V01	To incorporate individual preference for accessible vehicle in search results	User Preferences	Trip itineraries exclude non-ADA modes.	<p><u>Pre-condition:</u> Pivot web portal is open, and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Click on the gear icon at the top right of the screen. 2. Press the switch next to "Wheelchair Accessible" to enable this option. 3. Verify in the trip search that the options are wheelchair accessible and that other modes (e.g., scooters) have been removed from the options presented. <p><u>Pass criteria:</u> Verification by at least four independent testers: The options presented to the user can accommodate wheelchairs. The options presented are walking (or rolling), car, public transit, and ride hail. Scooter and bike are not shown.</p> <p><u>Post-condition:</u> The results presented are wheelchair accessible.</p>	Traveler II – Web	1/7/2021	Passed	<p>[1/7] Refreshed the browser multiple times and right options are provided.</p> <p>Defect MMTPA-WEB-DEF008 logged and resolved.</p>
MMTPA-WEB013-V01	To filter search results by environmental impact or "greenest" trip	User Preferences	Trip itineraries can be sorted by "eco-friendly".	<p><u>Pre-condition:</u> Pivot web portal is open, and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Enter an origin and destination to search for a trip. 2. Click "suggest" (next to sort). 3. Select "Eco-Friendly." 4. Verify results. <p><u>Pass criteria:</u> Verification by at least four independent testers: User's preferred sorting method changed. Travel options updated to match this choice.</p> <p><u>Post-condition:</u> N/A</p>	Traveler II – Web	1/6/2021	Passed	<p>[1/6] Times are not refreshed when you take few mins to select the route. Bus timings might be changed while sorting. There is no refresh button to refresh the results like the one on the app.</p> <p>When you go back from trip route steps page to trip results page, the sort by always default to 'Suggest' but the routes shown still are by whatever sort order is selected.</p> <p>Defect MMTPA-WEB-DEF009 logged and resolved.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-WEB014-V01	To successfully search for a scooter based on user's location.	Rides-Near-Me	A list of scooter locations is presented to the traveler.	<p><u>Pre-condition:</u> Pivot web portal is open, and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Zoom to the desired location to view scooter options. 2. Review ride options on the map. 3. Verify that rides appear by mode, by color, with mobility provider identified on the list. 4. Click on a mode to zoom to the location of selected ride. <p><u>Pass criteria:</u> Verification by at least four independent testers: Nearby scooter options are shown in the list; clicking on the ride provides distance of the mode location from the user's location.</p> <p><u>Post-condition:</u> N/A</p>	Traveler II – Web	1/6/2021	Passed	[1/6] Cannot see logo of lime when selected. Lime words is shown twice.
MMTPA-WEB015-V01	To successfully search for a bike based on user's location.	Rides-Near-Me	A list of bike locations is presented to the traveler.	<p><u>Pre-condition:</u> Pivot web portal is open, and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Zoom to the desired location to view bike options. 2. Review ride options on the map. 3. Verify that rides appear by mode, by color, with mobility provider identified on the list. 4. Click on a mode to zoom to the location of selected ride. <p><u>Pass criteria:</u> Verification by at least four independent testers: Nearby bike options are shown in the list; clicking on the ride provides distance of the mode location from the user's location.</p> <p><u>Post-condition:</u> N/A</p>	Traveler II – Web	1/6/2021	Passed	[1/6] Passed.

MMTPA-WEB016-V01	To demonstrate that the GUI allows for effective use of the application	User Interface	The GUI is intuitive, easy to use, and allows for effective use of the Pivot web portal.	<p><u>Pre-condition:</u> Pivot web portal is open, and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Verify that GUI elements such as map, text, icons, and font are organized to be intuitive and easy to understand to allow for effective use of the application. 2. Confirm the ability to navigate between screens without loss of data or having to start over. 3. Confirm that the GUI elements appear professional and exhibit a consistent "look and feel." <p><u>Pass criteria:</u> Verification by at least four independent testers: The web portal provides a GUI that passes basic tests for effective use.</p> <p><u>Post-condition:</u> N/A</p>	Traveler II – Web	1/6/2021 1/19/2021	Failed In progress	<p>[1/6] Preferences window keeps closing when trying to scroll with a mouse. Can see the scroll bar on the left side of the screen and when clicked on it the preferences window opens.</p> <p>When in vertical trips window and clicked on the back icon to go back to enter new where to address, doesn't give any trips or tab to enter 'from' location. 'From' location is not available.</p> <p>When in preferences window, and click on the map to exit the window, the preferences window stays on the screen.</p> <p>Mission North arrow and the map rotates when trying to move the screen and cannot realign the map.</p> <p>The map becomes 3d and rotates When right clicked on the map . Transparent bars.</p> <p>When in login window, and try to select the swiping, swiping makes Login panel to close when trying to select the text.</p> <p>Length of the trip plans keeps changing when we click within the trip window.</p> <p>Not all modes options are turned on for a new user without an account. All modes should be turned on except personal bike and personal car.</p> <p>With CPS gone, no need to logout upon website refresh.</p> <p>Changing language preferences should not force log out.</p> <p>When refreshed, the half window shows with loading screen, with smart Columbus and COTA logo. Screenshot attached.</p> <p>Defect MMTPA-WEB-DEF012 logged and resolved.</p> <p>Defect MMTPA-WEB-DEF013 logged and resolved.</p> <p>Defect MMTPA-WEB-DEF014 logged and in progress.</p> <p>Defect MMTPA-WEB-DEF015 logged and resolved.</p>
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TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-WEB017-V01	To demonstrate ability to set preferred language in the pivot web portal	Languages	Travelers can select English or Spanish as the display language in Pivot web portal.	<p><u>Pre-condition:</u> Pivot web portal is open, and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Press the gear at the top right of the screen. 2. Press 'English' under display language option. 3. Select 'Español' to change the desired language to Spanish. 4. Verify the display language updates to Spanish. <p><u>Pass criteria:</u> Verification by at least four independent testers: The display language shows the selected language. The text updates to the selected language.</p> <p><u>Post-condition:</u> Web portal displays text in Spanish.</p>	Traveler II – Web	1/6/2021 1/19/2021	Failed Passed	<p>[1/6] 'Selected, profile, sort by, leave', and all the trip itineraries are in English.</p> <p>[1/19] Passed.</p> <p>Defect MMTPA-WEB-DEF016 logged and in progress.</p> <p>Defect MMTPA-WEB-DEF023 logged and in progress.</p> <p>Defect MMTPA-WEB-DEF024 logged and resolved.</p> <p>Defect MMTPA-WEB-DEF025 logged and resolved.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-WEB018-V01	To demonstrate access to training and educational material in user's preferred language - Spanish	Languages	Travelers can view education material in either English or Spanish.	<p><u>Pre-condition:</u> Pivot web portal is open, and the tester is logged in.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Press the gear at the top right of the screen. 2. Press 'English' under display language option. 3. Select 'Español' to change the desired language to Spanish. 4. Verify the display language updates to Spanish. 5. Go back to the home page of the web. 6. Click "?" to open help page. 7. A new tab is opened in the browser with the help information. 8. Verify that the help site is displayed in Spanish. <p><u>Pass criteria:</u> Verification by at least four independent testers: The help site is displayed in Spanish.</p> <p><u>Post-condition:</u> The Pivot web portal remains opens in a different tab after a new tab opens with the help section.</p>	Traveler II – Web	1/6/2021 1/19/2021 1/26/2021	Failed In progress Passed	<p>[1/6] Help section is not in Spanish. [1/26] Passed.</p> <p>Defect MMTPA-WEB- DEF016 logged and in progress.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	TEST METRIC	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TEST COMMENT
MMTPA-WEB019-V01	To demonstrate that user preferences are same between app and web portal when logged in.	Pivot web portal	Account information is carried over from app when logged in on the web. (first name, last name and phone number missing).	<p><u>Pre-condition:</u> Tester has access to the web portal using latest version of Google Chrome, Apple Safari, or Microsoft Edge. Tester has an existing Pivot account.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Access the Pivot web portal. 2. Log in. 3. Click on View Profile. 4. Verify your First Name, Last Name and Phone Number. 5. Preferences and save locations should be carried over. <p><u>Pass criteria:</u> Verification by at least four independent testers: First Name, Last Name, and Phone Number are carried over from the Pivot app.</p> <p><u>Post-condition:</u> N/A</p>	Traveler II – Web	1/6/2021 1/19/2021	Failed Passed	<p>[1/6] Passwords were reset and all testers were not able to login to any accounts that are created on app or web.</p> <p>User is immediately logged out after saving profile information.</p> <p>When logged in, and page is refreshed, the user is immediately logged out.</p> <p>[1/19] Passed.</p> <p>Defect MMTPA-WEB- DEF017 logged and resolved.</p> <p>Defect MMTPA-WEB- DEF018 logged and resolved.</p>

Source: City of Columbus

3.4. DEFECT MANAGEMENT TOOL

The defect management tool was used during testing to capture, track, monitor, and address anomalies observed during the testing period. For each entry, the development team worked to understand the defect and reproduce it where possible, identify the root cause, summarize a response, and log the activities taken to resolve the issue. A defect tracker helped prioritize defects according to severity level (critical to low) and maintained traceability to the test ID, as well as status. The status field provides a simplified view of the various states a defect passes through as it moves toward resolution and closure. A defect can have the following status values:

- **Opened** – The defect has been logged and reported for correction.
- **Re-Opened** – A defect was once closed, and then was re-opened for modification.
- **Closed** – A defect was received, reviewed, and determined not a defect (i.e., determined to be a duplicate entry or request for enhancement). In these cases, no corrective action was taken, and the development team provided an explanation while closing out the defect ticket.
- **Canceled** – A scenario or test case in which the defect derived was canceled and therefore the defect was canceled by default.
- **Resolved** – A defect was reviewed and verified, and a resolution was implemented to solve the problem; the date when the defect was corrected was included.
- **Returned** – The defect was returned to the tester for additional information.
- **Deferred** – The defect was designated for correction for a later date.

If a conflict arose between a design element that tied to a requirement and the software product, the development manager coordinated with the test manager to determine whether a change to the system design and/or requirement was appropriate. The City of Columbus project manager (who was also the Test Plan test manager) carefully reviewed all CRs if they would impact the system design or requirements. All CRs were captured in the change logger tool.

Table 5, **Table 6**, and **Table 7** provide an overview of the defects captured and closed or resolved during testing.

Table 5: Pivot App Defect Management Matrix

DEFECT ID	DEFECT DESCRIPTION	SEVERITY	STATUS	TEST ID	RESOLUTION DESCRIPTION
MMTPA-APP-DEF001	Trips are impacted with the walking distance. No trip options for some testers at 0.25 miles and couple users got trip options at the same walking distance.	High	Closed	MMTPA-TRA010-V01	Trips are not impacted by walking distance since that is the same. If the user keeps hitting refresh, then it may have to do with GPS location; also, may be timeout issue with OTP. Checked with several trips - results included bus, bus + car, car, car with roll - .25 miles. Note that if ADA mode was not originally selected by user, it will not appear in settings when ADA selected.
MMTPA-APP-DEF002	When wheelchair accesibility is enabled the trip options provide ride-hail as an option.	High	Resolved 11/25/2020	MMTPA-TRA011-V01	The wheelchair accessibility option has been replaced with a phone number to call for Yellow Cab when selected.
MMTPA-APP-DEF003	The app did not recognize that the user was on the bus. The stops in the vertical navigation did not highlight and the horizontal navigation did not start.	High	Opened	MMTPA-SMH011-V01	Off route detection to be improved without refresh; losing GPS and need to reset trip.
MMTPA-APP-DEF004	Trip ends before user hits end.	High	Resolved 11/25/2020	N/A	This has been resolved by adding additional 15 min to timeout and End button is now active during entire route.
MMTPA-APP-DEF005	Link to Lyft takes you to a page that says "Ooops... Sorry we can't find that page"	High	Resolved 11/25/2020	MMTPA-TRB007-V01	Revised deep link provided by Lyft. The link requires Lyft to be installed with location services on.
MMTPA-APP-DEF006	Issues getting trip options with CoGo when only CoGo is selected but got trip options with only CoGo when scooter and other modes are selected.	High	Closed	MMTPA-TRB007-V01	Could not duplicate; further testing required based on origin and destination that was used by testers.

DEFECT ID	DEFECT DESCRIPTION	SEVERITY	STATUS	TEST ID	RESOLUTION DESCRIPTION
MMTPA-APP-DEF007	CoGo to ride-hail – the walking distance is set 0.25 miles but the app gives a trip with walking for 1 hr. 27 mins although CoGo is 10 feet from the user's current location. No CoGo to ride-hail option was provided.	High	Resolved 11/25/20	MMTPA-TRB007-V01	Navigation updated to address issue.
MMTPA-APP-DEF008	No message is provided when bike is no longer available.	Medium	Resolved 1/15/2021	MMTPA-TRB009-V01	Accuracy improved with update to CoGo feed.
MMTPA-APP-DEF009	No options for CoGo were provided even when within 10 feet of the CoGo station.	High	Resolved 11/25/2020	MMTPA-TRB007-V01	Navi updated to address issue.
MMTPA-APP-DEF010	The app did not automatically switch modes due to COTA feed. But if user left trip and returned, it did.	High	Resolved 12/18/2020	N/A	Off route detection improved without refresh; losing GPS and need to reset trip.
MMTPA-APP-DEF011	No rerouting provided when off-route.	Low	Resolved 12/18/2020	N/A	Rerouting for Navi turned on for everything but bus mode.
MMTPA-APP-DEF012	Kiosk quickly timed out between the sending verification info to phone and entering the verification code into the kiosk. User was able to verify after attempting several times, and a link was sent via text. However, when clicking on the link, the app opened, but no trip was displayed.	High	Resolved 11/29/2020	MMTPA-SMH001-V01	Resolved via Orange Barrel. Users may receive pop up warning user must be logged in.
MMTPA-APP-DEF013	Deep link only sends user to the Play Store and doesn't populate in Pivot when opening.	High	Resolved 11/25/2020	MMTPA-SMH001-V01	Deep link updated.
MMTPA-APP-DEF014	Switching language option logs the user out.	High	Resolved 11/25/2020	MMTPA-TRA022-V01	Switching languages no longer forces logout.
MMTPA-APP-DEF015	After selecting wheelchair, walk icon changes to wheelchair in More Options, but is not shown as selected if user does not previously have walk selected as a preferred mode.	Medium	Resolved 11/25/2020	MMTPA-TRA011-V01	Selection logic updated.

DEFECT ID	DEFECT DESCRIPTION	SEVERITY	STATUS	TEST ID	RESOLUTION DESCRIPTION
MMTPA-APP-DEF016	The north arrow will disappear after pressing it. In navigation, sometimes it is hidden. Also had an issue with arrow catching up to the direction the map was facing.	High	Resolved 11/29/2020	MMTPA-TRA021-V01	Resolved for navigation; position does not change and may not show up if map is rotated north.
MMTPA-APP-DEF017	Some testers report having issues with screen resolution and selected mode/icon appearing beneath the list on the map.	High	Resolved 11/25/2020	MMTPA-TRA021-V01	Icon display properties updated.
MMTPA-APP-DEF018	Trip time is not accurate. Personal car ride from home to work said 1 hr. 8 min and took 32 minutes.	High	Opened	N/A	Updated with inclusion of INRIX data back in trip plan.
MMTPA-APP-DEF019	User could not get a bus-ride-hail option with same preferences as other users for the same origin and destination.	Low	Closed	MMTPA-TRB012-V01	Could not duplicate. Tested on several devices with accurate results. Not a bug.
MMTPA-APP-DEF020	Distance reporting in miles to AMC Indian Mound 9 is showing up as "NaN mi".	High	Resolved 11/25/2020	MMTPA-TRB016-V01	"Not a Number" issue addressed.
MMTPA-APP-DEF021	Pivot did not provide ride-hailing options even when ride-hailing was selected.	High	Resolved 11/25/2020	MMTPA-TRB016-V01	Navi updated to address issue.
MMTPA-APP-DEF022	Not translated into Spanish: "Choose your ride-hail provider" and "Estimated Cost" when clicking on ride-hail trip; "On time" in itinerary; 'Bicycle' is not translated in the trip plan.	Low	Resolved 11/25/2020	MMTPA-TRA022-V01	Spanish translation added.

Source: City of Columbus

Table 6: Pivot Kiosk Defect Management Matrix

DEFECT ID	DEFECT DESCRIPTION	SEVERITY	STATUS	TEST ID	RESOLUTION DESCRIPTION
MMTPA-SMH-DEF001	Some users reported seeing a white screen when opening the app for the first time.	Med	Closed	MMTPA-SMH004-V01	Unable to duplicate issue.

DEFECT ID	DEFECT DESCRIPTION	SEVERITY	STATUS	TEST ID	RESOLUTION DESCRIPTION
MMTPA-SMH-DEF002	All trip plans were able to be accessed by entering in the wrong digit code.	High	Resolved 12/18/20	MMTPA-SMH005-V01	Updated process to check Pivot verification code.
MMTPA-SMH-DEF003	Could not end the trip on the pivot app. Clicked to end on the trip multiple times and the app just goes back to the trip. The Scheduled Trips tab has multiple trips for the same destination. Though the trips have been cancelled on the scheduled trips tab, the trip is still shown on the screen.	High	Resolved 12/18/20	MMTPA-SMH006-V01	Trips are now removed.
MMTPA-SMH-DEF004	At the library, user received error "undefined is not an object" when attempting to login.	High	Resolved 12/18/20	MMTPA-SMH007-V01	App updated to capture and handle error.
MMTPA-SMH-DEF005	It is difficult to see the whole email address of a long email to know that it was typed correctly, i.e. long email address scrolled off the screen.	Med	Closed	MMTPA-SMH001-V01	Developed as scoped.
MMTPA-SMH-DEF006	Some testers reported forced app closures after ending a trip.	High	Resolved 12/18/20	MMTPA-SMH006-V01	App updated to prevent forced closure.
MMTPA-SMH-DEF007	Nothing happened when the question mark icon was pressed. The help section was not presented.	Medium	Resolved 1/22/2021	MMTPA-SMH005-V01	Help functionality restored.
MMTPA-SMH-DEF008	When the bus preference was turned off and ride-hail and personal bike preference turned on, bus still showed up in the trip options.	High	Resolved 1/22/2021	MMTPA-SMH006-V01	Issue resolved with GTFS feed update.
MMTPA-SMH-DEF009	When turning the wheelchair accessibility preference on, all modes are still available and walk, bus and ride-hail are turned on. When scheduling a trip with wheelchair accessibility selected, ride-hail is the only option that shows up – bus options are not presented.	High	Resolved 1/22/2021	MMTPA-SMH011-V01	Issue resolved with GTFS feed update.

DEFECT ID	DEFECT DESCRIPTION	SEVERITY	STATUS	TEST ID	RESOLUTION DESCRIPTION
MMTPA-SMH-DEF010	Bus options are not presented with wheelchair accessibility option turned on.	High	Resolved 1/22/2021	MMTPA-SMH012-V01	Issue resolved with GTFS feed update.
MMTPA-SMH-DEF011	Other modes have not been removed when switching to wheelchair accessible.	High	Resolved 1/22/2021	MMTPA-SMH013-V01	Issue resolved with GTFS feed update.
MMTPA-SMH-DEF012	Eco-friendly only works without using personal bike as an option since personal bike for the whole trip would have been the most eco-friendly option.	Low	Closed	MMTPA-SMH014-V01	Unable to duplicate issue.
MMTPA-SMH-DEF013	Other characters appeared on screen when using backspace to delete the already entered where to location.	Medium	Closed	MMTPA-SMH017-V01	Was not able to duplicate. Will follow-up with Orange Barrell.
MMTPA-SMH-DEF014	Copy or copy paste options would occasionally pop-up on screen.	Medium	Opened	MMTPA-SMH017-V01	In progress.
MMTPA-SMH-DEF015	Background map keeps moving when users try to close screens or options/preferences.	Medium	Resolved 1/26/2021	MMTPA-SMH017-V01	Map issue resolved.
MMTPA-SMH-DEF016	No north arrow.	Low	Resolved 1/22/2021	MMTPA-SMH017-V01	North arrow added to the map.
MMTPA-SMH-DEF017	Map has a 3D image rotation feature without an undo feature.	Low	Resolved 1/22/2021	MMTPA-SMH017-V01	Adding back the map north arrow functionality resolved the rotation issue.
MMTPA-SMH-DEF018	Same sections do not convert to Spanish as the website.	Medium	Resolved 1/22/2021	MMTPA-SMH018-V01	Spanish conversion updated.
MMTPA-SMH-DEF019	During this test, one tester removed everything but busses to test transfers and ride-hail continue to show up as an option. It was a ride-hail only option that appeared. Other mode trip options were provided even without selecting those modes in preferences.	Low	Opened	MMTPA-SMH008-V01	Defect does not hinder user's ability to plan a trip, but does not match user expectations.

Source: City of Columbus

Table 7: Pivot Web Portal Defect Management Matrix

DEFECT ID	DEFECT DESCRIPTION	SEVERITY	STATUS	TEST ID	RESOLUTION DESCRIPTION
MMTPA-WEB-DEF001	Preferred modes count on the web is different from how the app shows when everything is selected (10 vs 6).	High	Resolved 12/18/20	MMTPA-WEB005-V01	Count updated to match app.
MMTPA-WEB-DEF002	Under settings, user can change the bus transfers, walking distance or trip cost but cannot click 'Apply'.	High	Resolved 12/18/20	MMTPA-WEB006-V01	Apply issue addressed.
MMTPA-WEB-DEF003	Trip metrics is missing on the web.	High	Closed	MMTPA-WEB007-V01	Trip metrics should not be available on the web.
MMTPA-WEB-DEF004	Account information is not carried over from the app when logged in on the web. First name, last name and phone number are missing.	High	Closed	MMTPA-WEB008-V01	Could not duplicate.
MMTPA-WEB-DEF005	Preferred modes screen jumps from right to left when trying to close the settings window by clicking on the map.	High	Resolved 12/18/20	MMTPA-WEB009-V01	Panel functionality updated.
MMTPA-WEB-DEF006	When the web portal is refreshed, a loading screen flashes underneath the map. The loading screen is ½ width of the screen and text is cut off.	High	Resolved 12/18/20	MMTPA-WEB010-V01	Loading screen now appears full screen.
MMTPA-WEB-DEF007	When clicked on the link of the trip that was sent to the phone, the new trip does not override the already existing route that is within the app though the route was not started.	High	Closed	MMTPA-WEB001-V01	Will not override, works as scoped.
MMTPA-WEB-DEF008	Could not end the trip after clicking on the text message link.	High	Resolved 1/22/2021	MMTPA-WEB012-V01	Updated to allow ending trip.

DEFECT ID	DEFECT DESCRIPTION	SEVERITY	STATUS	TEST ID	RESOLUTION DESCRIPTION
MMTPA-WEB-DEF009	Dragging the cursor to select text on the left panel causes the panel to close. For example, selecting password text from right to left causes the panel to close automatically.	Low	Resolved 1/21/2021	MMTPA-WEB013-V01	Panel updated to prevent close event when selecting text.
MMTPA-WEB-DEF010	Users cannot log into accounts that were created on the web or app once password has been reset. When trying to login with new password, the following error is presented: 'Error Updating Token' and Cannot set property 'accessToken' of undefined.	High	Resolved 1/21/2021	MMTPA-WEB005-V01	Password reset functionality updated to prevent login issues.
MMTPA-WEB-DEF011	The verification code email includes Pivot Trip Code as the subject but says Pivot verification code in the text.	Medium	Resolved 1/21/2021	MMTPA-WEB005-V01	Email template updated.
MMTPA-WEB-DEF012	The preferences window keeps closing when trying to scroll with a mouse. Users can see the scroll bar on the left side of the screen and when clicked on the preferences window opens.	High	Resolved 1/21/2021	MMTPA-WEB016-V01	Scroll functionality updated.
MMTPA-WEB-DEF013	Missing North arrow and the map rotates when right-clicked on.	Medium	Resolved 1/21/2021	MMTPA-WEB016-V01	North arrow added to the map.
MMTPA-WEB-DEF014	Transparent bars appear in the vertical trip plan.	Low	Opened	MMTPA-WEB016-V01	Continue to work to resolve for maintenance release.
MMTPA-WEB-DEF015	Changing language preferences forces log out.	Medium	Resolved 1/21/2021	MMTPA-WEB016-V01	Changing language selection updated to apply automatically without forcing log out.

DEFECT ID	DEFECT DESCRIPTION	SEVERITY	STATUS	TEST ID	RESOLUTION DESCRIPTION
MMTPA-WEB-DEF016	<p>Spanish translation missing for the following: 'Selected', 'Profile', 'Sort by', 'Leave', all trip itineraries, Help section text and images, 'First Name', 'Last Name', 'Phone Number', and 'Send to'.</p> <p>Profile information lost when language is changed to Spanish.</p> <p>User logged in and changed language to Spanish, logged out, changed language to English. Logged back in and everything was in Spanish which is as per the settings set before logging out. Went to settings to change to English but English was already selected as language.</p>	Medium	Opened	MMTPA-WEB017-V01 MMTPA-WEB018-V01	All items resolved except for log in/log out issue (will be addressed under support and maintenance)
MMTPA-WEB-DEF017	User is immediately logged out after saving profile information.	High	Resolved 1/21/2021	MMTPA-WEB019-V01	Clicking Save now refreshes the form and does not force log out.
MMTPA-WEB-DEF018	When logged in and the page is refreshed, the user is immediately logged out.	Medium	Resolved 1/21/2021	MMTPA-WEB019-V01	Refreshing the page no longer forces a log out.
MMTPA-WEB-DEF019	When in vertical trips window and user clicks on the back icon to enter new 'where to' address, the 'from' location is not available.	Medium	Resolved 1/21/2021	MMTPA-WEB006-V01	Site updated to always show 'from' and 'to' location.
MMTPA-WEB-DEF020	When in profile page, user clicked on the upper-left corner and which opened the settings page.	Medium	Resolved 03/03/2021	MMTPA-WEB005-V01	Click area adjusted for web browser.
MMTPA-WEB-DEF021	After selecting a trip with personal bike, instead of the word 'Bike' random text is displayed in the trip plan.	Medium	Resolved 1/26/2021	MMTPA-WEB006-V01	Bike text resolved.
MMTPA-WEB-DEF022	Dollar amount and distance text are overlapped under trip plan.	Medium	Resolved 1/26/2021	MMTPA-WEB006-V01	Display issue resolved.

DEFECT ID	DEFECT DESCRIPTION	SEVERITY	STATUS	TEST ID	RESOLUTION DESCRIPTION
MMTPA-WEB-DEF023	Trip bars are cut off when going back and forth between clicking trips. The cut off pieces are transparent.	Medium	Opened	MMTPA-WEB016-V01	In progress.
MMTPA-WEB-DEF024	Wait icon within trip plan is overlapped with multiple wait icons	Medium	Resolved 1/26/2021	MMTPA-WEB016-V01	Display issue resolved.
MMTPA-WEB-DEF025	Bus numbers and sun or cloud icon were missing within trip plan.	Medium	Resolved 1/26/2021	MMTPA-WEB016-V01	Display issue resolved.

Source: City of Columbus

3.5. CHANGE REQUEST LOG

This section documents the CRs that were captured, evaluated, and substantiated throughout the testing life cycle.

Table 8: Pivot App Change Request Log

CHANGE REQUEST ID	CHANGE REQUEST DESCRIPTION	JUSTIFICATION	DEFECT ID	RFP NUMBER	STATUS
MMTPA-APP-CR001	The MMTPA should recalculate the end time for a scheduled trip once the trip is in progress to account for any changes in travel time from when the trip was originally scheduled.	Bus ride timings did not match between different users. Same route but different bus timings.	N/A	4.1.2.2	Approved. End time is updated accordingly once the user executes the trip and the Pivot app is in navigation mode.

CHANGE REQUEST ID	CHANGE REQUEST DESCRIPTION	JUSTIFICATION	DEFECT ID	RFP NUMBER	STATUS
MMTPA-APP-CR002	In app messaging should be provided for late arrivals or missed bus connections to inform users of the need to update trip plans.	Late arrivals or missed connections results in users having to cancel trips and create alternate trip plan to avoid being stranded.	N/A	6.1.3, 6.1.6	Approved. New messaging added to address late arrival of busses. If a user is running late, messaging provided to hurry up or you'll miss your bus. If bus is missed, trip plan is updated, or user is asked to plan trip again.
MMTPA-APP-CR003	Users should be able to recover lost or forgotten passwords.	Without the ability to recover passwords users are forced to uninstall the Pivot app and recreate their accounts.	N/A	4.1.3.1.12	Approved. Forgot password functionality added.
MMTPA-APP-CR004	Users should be able to logout of the MMTPA.	Without the ability to logout users are forced to uninstall the Pivot to effectively sign out.	N/A	4.1.3.1.12	Approved. Logout button added.
MMTPA-APP-CR005	Preference for "Max Transfers" should apply to bus transfers only.	Rename preference to be "Max Bus Transfers" to avoid confusion.	N/A	4.1.3.1.3	Approved. User preferences updated to show 'Max Bus Transfers'.
MMTPA-APP-CR006	Walk and bike distance should be expressed in miles (using decimal format) in the vertical trip plan. The same applies for "roll" distance when wheelchair accessibility is selected as a user preference.	Users need to be informed of how far it will be to bike, walk or roll to plan trips accordingly.	N/A	4.1.3.1.8	Approved. Revised to only show values greater than .25 miles; less than that will be <.25 miles.
MMTPA-APP-CR007	Users should be informed of the number of available bikes and scooters on the map for each location.	Users need to be informed of how many vehicles are available in case of short supply.	N/A	4.2.3.1	Approved. Number of scooters available is provided (bikes are not).

CHANGE REQUEST ID	CHANGE REQUEST DESCRIPTION	JUSTIFICATION	DEFECT ID	RFP NUMBER	STATUS
MMTPA-APP-CR008	The MMTPA should automatically reroute users of all modes except for bus when a different route is taken than the route which is displayed in navigation.	In personal vehicle, if the driver takes a different route, the app does not reroute the driver	N/A	4.1.5.1	Approved. Rerouting for Navi will be turned on for everything but bus mode - need to test.
MMTPA-APP-CR009	The MMTPA should include a phone number for travelers to call to reserve a wheelchair accessible ride.	The existing Yellow Cab API does not allow for arrival time notifications and estimated wait times.	N/A	4.1.3.1.9 4.1.2.3	Approved. Yellow Cab API integration will be revisited post go-live.

Source: City of Columbus

Table 9: Pivot Kiosk Change Request Log

CHANGE REQUEST ID	CHANGE REQUEST DESCRIPTION	JUSTIFICATION	DEFECT ID	RFP NUMBER	STATUS
MMTPA-SMH-CR001	The Pivot kiosk app should denote “bus” transfers like the app.	Consistency with the Pivot app and to avoid confusion.	MMTPA-SMH-OIS003	N/A	Approved. Updated to include ‘Max Bus Transfers’ for consistency with Pivot app.
MMTPA-SMH-CR002	The Pivot kiosk app should display the same wheelchair accessibility preferences and functionality as the Pivot app.	Consistency with the Pivot app and to avoid confusion.	MMTPA-SMH-OIS004	N/A	Approved. Wheelchair accessibility updated to same as Pivot app.
MMTPA-SMH-CR003	The Pivot kiosk app should default to having all modes on except for personal bike and car.	Consistency with the Pivot app and to provide more mode options in the trip results by default.	MMTPA-SMH-OIS005	N/A	Approved. Updated to reflect same mode options by default as Pivot app.

Source: City of Columbus

Table 10: Pivot Web Portal Change Request Log

CHANGE REQUEST ID	CHANGE REQUEST DESCRIPTION	JUSTIFICATION	DEFECT ID	RFP NUMBER	STATUS
MMTPA-WEB-CR001	Clicking on the map should allow users to move the map without adding a pin to get directions.	Not possible to move the map without adding a pin to get directions.	N/A	N/A	Approved. Clicking on the map allows users to drag the map to pan.
MMTPA-WEB-CR002	Max transfers user preference should denote “bus” transfers like the app.	Consistency with the Pivot app.	N/A	N/A	Approved. User preferences updated to show ‘Max Bus Transfers’.
MMTPA-WEB-CR003	Users should be able to click the back button in the vertical trip plan to reenter to and from location information.	To ensure users are always able to enter origin and destination.	MMTPA-WEB-DEF019	N/A	Approved. ‘From Where’ and ‘To Where’ text boxes are both available.
MMTPA-WEB-CR004	Trip information steps should include walking distance and time.	Consistency with the Pivot app. Web portal only shows time to walk or bike.		N/A	Approved. Walking distance and time added to the steps.
MMTPA-WEB-CR005	Lime logo should be added to the map.	Include logo for consistency with the other services.	MMTPA-WEB-OIS011	N/A	Approved. Logo added to the map.
MMTPA-WEB-CR006	Users should not have to re-log in each time the Pivot web portal page is refreshed.	With CPS gone, no need to logout upon website refresh.	MMTPA-WEB-OIS013	N/A	Approved. User login persists after refreshing the page.
MMTPA-WEB-CR007	Bookmark icons should not remain blue when a saved place is un-favorited.	Icon should match the state of the bookmark to avoid confusion.	MMTPA-WEB-OIS018	N/A	Approved. Bookmark icons revert to gray with unsaved.
MMTPA-WEB-CR008	The preferred modes window should close when a user clicks away and not remain on the screen.	Expected behavior and better user experience.	MMTPA-WEB-OIS024	N/A	Approved. Preferred modes window closes.

CHANGE REQUEST ID	CHANGE REQUEST DESCRIPTION	JUSTIFICATION	DEFECT ID	RFP NUMBER	STATUS
MMTPA-WEB-CR009	Users should not be required to share location with the Pivot web portal in order to plan a trip.	Users are currently unable to plan a trip without enabling “share location” with the web browser. Location should only be required to execute a trip.	MMTPA-WEB-OIS002	N/A	Approved. ‘From Where’ and ‘To Where’ are now available to plan a trip without sharing location with browser.

Source: City of Columbus

3.6. OUTSTANDING ISSUES

This section discusses any requests for enhancement the project is tracking along with the reason it remains open. Outstanding issues are not the result of failed functionality, but feedback from the test team on how to improve the application.

Table 11: Pivot App Outstanding Issues

CHANGE REQUEST ID	ISSUE DESCRIPTION	JUSTIFICATION	ISSUE ID	RFP NUMBER	STATUS
MMTPA-APP-CR010	The weather on top of the trip itinerary should be translated into Spanish.	All elements of the trip plan should be translated into Spanish per user preferences.	MMTPA-APP-OIS001	N/A	Deferred. This functionality is dependent on an external API.
MMTPA-APP-CR011	CABS buses should be displayed on the map.	CABS buses are different from COTA busses and should be displayed separately on the map.	MMTPA-APP-OIS002	4.2.3.1	Deferred. Will continue to work with OSU. Need to confirm with CABS the availability of GTFS real-time feed (other than the one ETCH created).

CHANGE REQUEST ID	ISSUE DESCRIPTION	JUSTIFICATION	ISSUE ID	RFP NUMBER	STATUS
MMTPA-APP-CR012	Trip costs for ride hail services should be updated when a trip plan is requested to reflect actual trip costs.	Prices for ride hail are dynamic and subject to change. The Bird app indicated a trip cost of \$3.50 minimum plus tax. The actual trip estimate was around \$2.65 or \$2.80, although it ended up being more.	MMTPA-APP-OIS003	4.1.2.2	Pending review. Requires access to a more sophisticated APIs for price information. Etch will check scooter and bike costs every 30 days; ideal situation is to have mobility providers put in GBFS 2.0 feed; will work with DPS.
MMTPA-APP-CR013	Users should be able to filter the list of rental vehicles based on user preferences	For example, if a user does not have Bird selected as a preferred mode it should not be displayed in the rentals list.	MMTPA-APP-OIS004	4.1.3.1.4	Pending review (not in progress).
MMTPA-APP-CR014	Voice navigation should include ramps and exits.	App says continue on ramp when taking an exit but doesn't say which exit.	MMTPA-APP-OIS005	6.1.3	Pending review (not in progress).
MMTPA-APP-CR015	Voice commands should start from the traveler's current position rather than the traveler's point of origin when the MMTPA is closed and then reopened while a trip is in progress.	If the app is reopened and voice commands start from the point of origin, the commands will not match progress in the navigation.	MMTPA-APP-OIS006	6.1.3	In progress. Currently the app will catch up. Will review ways to enhance.
MMTPA-APP-CR016	Personal vehicles should include the cost of gasoline in the vertical trip plan.	If sorting by cheapest, personal car shows \$0 and may show out of order because of factoring in the cost to drive.	MMTPA-APP-OIS007	4.1.3.1.4	Pending review. A previous decision was made to show personal vehicle cost as \$0. Need to decide on whether to update again to include cost to drive.

CHANGE REQUEST ID	ISSUE DESCRIPTION	JUSTIFICATION	ISSUE ID	RFP NUMBER	STATUS
MMTPA-APP-CR017	Metrics should display pie charts and fixed 30-day time frame.	Pie charts are a more reliable and readily understood metric than % increase as was shown previously.	MMTPA-APP-OIS008	4.2.3.1	In progress. Will be included in future maintenance release.
MMTPA-APP-CR018	Weather information in the trip itinerary should be translated into Spanish.	Weather should be translated into Spanish the same as other elements of the trip itinerary.	MMTPA-APP-OIS009	N/A	Deferred. This change is dependent on an external API.

Source: City of Columbus

Table 12: Pivot Kiosk Outstanding Issues

CHANGE REQUEST ID	ISSUE DESCRIPTION	JUSTIFICATION	ISSUE ID	RFP NUMBER	STATUS
MMTPA-SMH-CR004	The Pivot kiosk app should display the trip plan sent to the user's smartphone from the kiosk without requiring the user to log in or register an account. However, in order to execute the trip, the user must log in or create an account.	Users are unable to preview trip plan on their smartphones without an account. Users should be able to plan a trip without requiring an account.	MMTPA-SMH-OIS001	4.1.3.1.12	In review.
MMTPA-SMH-CR005	The Pivot kiosk app should provide additional messaging for users who need to register first and then re-open the text message link sent from the kiosk to the smartphone.	It may not be clear to users that they must reopen the link from the kiosk in order to view trip plan.	MMTPA-SMH-OIS002	4.1.3.1.12	In review.

Source: City of Columbus

Table 13: Pivot Web Portal Outstanding Issues

CHANGE REQUEST ID	ISSUE DESCRIPTION	JUSTIFICATION	ISSUE ID	RFP NUMBER	STATUS
MMTPA-WEB-CR010	The Pivot web portal should limit the number of scooters and bikes shown on the screen to only a certain radius from the users current or selected location.	Limiting the search radius will aid the user in selecting a scooter or bike.	MMTPA-WEB-OIS001	4.2.3.1	In review.
MMTPA-WEB-CR011	The Pivot web portal should use responsive web design to ensure usability across different device types and screen sizes.	Users on tablets and phones are not currently able to see the whole contents of the screen when at regular zoom (100%).	MMTPA-WEB-OIS003	N/A	In review.
MMTPA-WEB-CR012	Entering a verification code should not cause the Pivot web portal to reload.	Reloading the site after verification is only necessary on kiosks.	MMTPA-WEB-OIS004	N/A	In review. This functionality is from the kiosk specs and can be disabled for the web.
MMTPA-WEB-CR013	The Pivot web portal should use the same Help page format as the Pivot mobile app.	The Pivot app help page has been updated to be more informative and user friendly.	MMTPA-WEB-OIS005	N/A	Pending review (not in progress).
MMTPA-WEB-CR014	Upon entering an incorrect 7-digit or more verification code, the Pivot web portal should display an error message.	User may not be aware the wrong code has been entered. Better user feedback will help avoid confusion.	MMTPA-WEB-OIS006	N/A	Pending review (not in progress).

CHANGE REQUEST ID	ISSUE DESCRIPTION	JUSTIFICATION	ISSUE ID	RFP NUMBER	STATUS
MMTPA-WEB-CR015	The Sort By function should not default to 'Suggest' as the title when a user clicks from the trip details back to the trip results, but should retain the title of whichever active sort is applied to the trip results.	Users may not realize a sort filter has already been applied to the trip search results.	MMTPA-WEB-OIS008	N/A	Pending review (not in progress).
MMTPA-WEB-CR016	The Pivot web portal should allow users to refresh trip results and times so that the information is up-to-date.	Consistency with the Pivot app. Bus timings might change while users are in trip results before booking the trip.	MMTPA-WEB-OIS010	N/A	Pending review (not in progress).
MMTPA-WEB-CR017	The email subject line for password reset should say Password Reset Code and not Pivot Verification code.	To avoid confusion.	MMTPA-WEB-OIS015	N/A	Pending review (not in progress).
MMTPA-WEB-CR018	A hand icon should be displayed when hovering the mouse over Delete Account, Logout, Terms of Use or Privacy Policy text.	To provide users with a consistent look and feel. A hand icon appears when hovering over Saved Places.	MMTPA-WEB-OIS016	N/A	Pending review (not in progress).
MMTPA-WEB-CR019	Users should be allowed to name saved places.	To make it easier for users to recall saved places.	MMTPA-WEB-OIS017	N/A	Pending review (not in progress).
MMTPA-WEB-CR020	Save button on user profile should be a save and close button.	To eliminate a step of having to save first and then close the modal window.	MMTPA-WEB-OIS019	N/A	Pending review (not in progress).
MMTPA-WEB-CR021	Saved Places should include the full address.	To provide complete information to the user about the saved place.	MMTPA-WEB-OIS020	N/A	Pending review (not in progress).

CHANGE REQUEST ID	ISSUE DESCRIPTION	JUSTIFICATION	ISSUE ID	RFP NUMBER	STATUS
MMTPA-WEB-CR022	The length of the trip bars in the vertical trip plan should not change size when clicking within the trip plan window or when bookmarking a saved place.	To ensure a consistent graphical representation of trip length when interacting with the app.	MMTPA-WEB-OIS021	N/A	Pending review (not in progress).
MMTPA-WEB-CR023	The walking distance in the trip results should not be more than the set distance within user preferences.	To provide consistency with user preferences. Walking distance calculation should be consistent with kiosk and app.	MMTPA-WEB-OIS022	N/A	Pending review (not in progress). A previous decision was made to provide a hard cutoff. Needs to be more clear to users how walking distance is calculated.
MMTPA-WEB-CR024	Spin should be removed from the map options.	Deep linking currently not available from Spin.	MMTPA-WEB-OIS023	N/A	In progress. Will continue to work with Spin on API integration.

Source: City of Columbus

Chapter 4. Summary of Results

Test results for each test case in Chapter 3 are documented in this section of the test report. All functions were tested under leadership of the system owner, test manager, and deputy test manager. Throughout this process, any bugs, inconsistencies, errors, and so forth have been captured in the defect tool and reported to the development team. The development team has followed the Change Control process to address any issues that arose during testing.

After final evaluation of all the deferred and failed test cases the test report will be updated and required authorization will be taken from the project team for the launch of the project.

4.1. TEST METRICS

This section identifies the test metrics from executing the test plan. The Pivot app received a 98% pass ratio in relation to all test cases and a 100% pass ratio in relation to failures. The Pivot kiosk received a 95% pass ratio in relation to all test cases and a 100% pass ratio in relation to failures. The Pivot web portal received an 84% pass ratio in relation to all test cases and a 100% pass ratio in relation to failures.

Table 14: Test Results Summary

		Total Planned	Total Deferred	In Progress	Total Failed	Total Cancelled	Total Passed
Pivot App	Total Number of Tests	49	1	0	0	0	48
	Percentage	-	2%	0%	0%	0%	98%
Pivot Kiosk	Total Number of Tests	19	0	0	0	0	19
	Percentage	-	0%	0%	0%	0%	100%
Pivot Web Portal	Total Number of Tests	19	1	1	0	0	17
	Percentage	-	5%	5%	0%	0%	90%

Source: City of Columbus

Table 15: Defect Matrix Open vs Closed

	Defect Status	Total	High	Medium	Low
Pivot App	Open	2	2	0	0
	Closed	3	2	0	1
	Canceled	0	0	0	0
	Resolved	17	13	2	2
	Deferred	0	0	0	0

	Defect Status	Total	High	Medium	Low
Pivot Kiosk	Open	2	0	1	1
	Closed	4	0	3	1
	Canceled	0	0	0	0
	Resolved	13	8	3	2
	Deferred	0	0	0	0
Pivot Web Portal	Open	3	0	2	1
	Closed	3	3	0	0
	Canceled	0	0	0	0
	Resolved	19	8	10	1
	Deferred	0	0	0	0

Source: City of Columbus

Table 16: Change Request Status

Change Request Status	Approved	Submitted	Total
Pivot App	9	9	18
Pivot Kiosk	3	2	5
Pivot Web Portal	9	15	24

Source: City of Columbus

4.2. CONTRACTUAL DOCUMENTS

Table 17 contains the contractual requirements for the MMTPA to be completed before the end of the demonstration period. Note: the Training Guide is a living document and subject to change with future revisions of the Pivot app. Data Backup and Recovery will be refreshed as part of the O&M Plan documentation requirement.

Table 17: Contractual Documents

Phase	Contractual Requirement	Status	Comment
Prior to UAT	Quality Assurance/Quality Control Plan	<i>Complete</i>	Refer to MTECH Solutions Project Management Plan
	Interfaces with External Systems and Other Smart Columbus Projects	<i>Complete</i>	Refer to Smart Columbus System Architecture and Standards Plan

Phase	Contractual Requirement	Status	Comment
Prior to deployment	Training Plan	<i>Complete</i>	Refer to Pivot Manual and Training Guide
	Test Results Documentation	<i>Complete</i>	Refer to this document.
	Communications Plan	<i>Complete</i>	Refer to Pivot Communications Plan and MTECH Solutions Project Management Plan
	Data Backup and Recovery Plan	<i>Complete</i>	Refer to MTECH Safety and Security Plan
After deployment	Overall System Schematic and Architecture	<i>Complete</i>	Refer to Smart Columbus System Architecture and Standards Plan
	Operations and Maintenance Plan	<i>In progress</i>	Refer to Multimodal Trip Planning Application Operations and Maintenance Plan, due to USDOT on 3/22/2021

Source: City of Columbus

4.3. EXIT CRITERIA

Table 18 summarizes the conditions that were required to considered testing complete.

Table 18: Test Exit Criteria




Criteria	Met/Not Met
All planned test cases and scenarios have been executed	<i>Met</i>
All planned test scenarios achieve a 95% pass ratio (in relation to failures)	<i>Met</i>
All defects found have been recorded in the defect management tool	<i>Met</i>
All high-severity defects have been resolved and retested	<i>Met</i>
Outstanding issues have a plan and schedule for resolution	<i>Met</i>

Source: City of Columbus

Chapter 5. Personnel

The information being reported on this document is correct and grants permission for the project to move forward with the production deployment.

Table 19: Test Signoffs

Tester	Role	Name	Date	Signature
System Owner	City of Columbus representative overseeing the completion of all projects and testing.	Andy Wolpert	03/04/2021	
Test Manager	Develops testing report summaries and scheduling	Jeff Kupko	03/04/2021	
Technical Tester	A technically advanced user able to perform advanced system tests, such as validate point-to-point data protection.	Jarred Olsen	03/05/2021	

Source: City of Columbus

Appendix A. Pivot API Load Testing Test Results

A.1 LOAD TESTING STATUS

Because the Pivot APIs are hosted in AWS and set to auto-scale automatically, the project team determined that it was not necessary to test load at high levels in preparation for go-live. Furthermore, the Pivot APIs were verified to be operating as designed as part of release testing of the Pivot app in August of 2019. In the event that hosting of the Pivot application is transferred from AWS to another hosting solution provider, it will then be necessary to load test the APIs in the new environment to ensure that all functions will run efficiently when scaled up, service quotas and throttling limits are sufficiently configured, and potential bottlenecks in downstream services, such as queuing, caching or pooling, are identified prior to transitioning to the new hosting environment. Until such time, the Pivot API load testing test procedures will remain canceled.

Table 20 contains all the server-side APIs used by Pivot. This covers the full range of communications that would be affected by the amount of user demand. Deep linking APIs to mobility providers are not included in this table.

Table 20: Pivot Load Testing Test Results Matrix

API	Description	Endpoint	Test ID	Test Type	Trace Method	Test Objective	Test Metric	Test Procedures	Test Group	Status
WebSocket	This API sends regular updates that pertain to each user, such as scooter availability changes near their GPS location. It needs to track each active trip.	N/A	MMTPA-API001-V01	API	Test	To test load at peak levels of demand to determine per-user scaling cost.	API can auto-scale to handle peak levels of demand and peak load capacity.	<p><u>Pre-condition:</u> Script are prepared to run in Pivot staging system.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> Execute script that runs hundreds of users simultaneously for an hour-long period and measures response time of requests. Output report that summarizes the results and estimates a total scaling cost based on peak demand requirements and per-user cost. <p><u>Pass criteria:</u> Verification by MTech that API can auto-scale to meet demand.</p>	Technical	Canceled
Geocoding API	<p>This API looks up the coordinates of a place that the user types in or looks up the place name/address for a location the user chooses from the map.</p> <p>This API is called for every text change to perform the autocomplete every time the user is typing in a place search.</p>	https://mmapi.etch.app/geocode	MMTPA-API002-V01	API	Test	To test load at peak levels of demand to determine per-user scaling cost.	API can auto-scale to handle peak levels of demand and peak load capacity.	<p><u>Pre-condition:</u> Script are prepared to run in Pivot staging system.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> Execute script that runs hundreds of users simultaneously for an hour-long period and measures response time of requests. Output report that summarizes the results and estimates a total scaling cost based on peak demand requirements and per-user cost. <p><u>Pass criteria:</u> Verification by MTech that API can auto-scale to meet demand.</p>	Technical	Canceled

API	Description	Endpoint	Test ID	Test Type	Trace Method	Test Objective	Test Metric	Test Procedures	Test Group	Status
OpenTripPlanner API	<p>This API calculates possible trip plans for a given origin, destination, and desired mode selection.</p> <p>This is expected to be the performance bottleneck given its high compute cost for searching the travel network.</p>	https://mmapi.etch.app/opentripplanner/otp/	MMTPA-API003-V01	API	Test	To test load at peak levels of demand to determine per-user scaling cost.	API can auto-scale to handle peak levels of demand and peak load capacity.	<p><u>Pre-condition:</u> Script are prepared to run in Pivot staging system.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Execute script that runs hundreds of users simultaneously for an hour-long period and measures response time of requests. 2. Output report that summarizes the results and estimates a total scaling cost based on peak demand requirements and per-user cost. <p><u>Pass criteria:</u> Verification by MTech that API can auto-scale to meet demand.</p>	Technical	Canceled
TripBooking API	<p>This API is called when a user adds a trip in the itinerary.</p>	https://mmapi.etch.app/book	MMTPA-API004-V01	API	Test	To test load at peak levels of demand to determine per-user scaling cost.	API can auto-scale to handle peak levels of demand and peak load capacity.	<p><u>Pre-condition:</u> Script are prepared to run in Pivot staging system.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Execute script that runs hundreds of users simultaneously for an hour-long period and measures response time of requests. 2. Output report that summarizes the results and estimates a total scaling cost based on peak demand requirements and per-user cost. <p><u>Pass criteria:</u> Verification by MTech that API can auto-scale to meet demand.</p>	Technical	Canceled

API	Description	Endpoint	Test ID	Test Type	Trace Method	Test Objective	Test Metric	Test Procedures	Test Group	Status
TripBooking API	This API is called when a user removes a trip in the itinerary.	https://mmapi.etch.app/book/cancel	MMTPA-API005-V01	API	Test	To test load at peak levels of demand to determine per-user scaling cost.	API can auto-scale to handle peak levels of demand and peak load capacity.	<p><u>Pre-condition:</u> Script are prepared to run in Pivot staging system.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Execute script that runs hundreds of users simultaneously for an hour-long period and measures response time of requests. 2. Output report that summarizes the results and estimates a total scaling cost based on peak demand requirements and per-user cost. <p><u>Pass criteria:</u> Verification by MTech that API can auto-scale to meet demand.</p>	Technical	Canceled
Feedback API	This API is call whenever a user submits comments to the Feedback screen or rates a trip after completing it. It is also called automatically when a trip can't be found for a given destination. Takes inputs: {type, comment, ratings, trip}	https://mmapi.etch.app/feedback	MMTPA-API006-V01	API	Test	To test load at peak levels of demand to determine per-user scaling cost.	API can auto-scale to handle peak levels of demand and peak load capacity.	<p><u>Pre-condition:</u> Script are prepared to run in Pivot staging system.</p> <p><u>Steps:</u></p> <ol style="list-style-type: none"> 1. Execute script that runs hundreds of users simultaneously for an hour-long period and measures response time of requests. 2. Output report that summarizes the results and estimates a total scaling cost based on peak demand requirements and per-user cost. <p><u>Pass criteria:</u> Verification by MTech that API can auto-scale to meet demand.</p>	Technical	Canceled

Source: City of Columbus

Verification Completed By:

Name: **Jeff Kupko, Test Manager, Michael Baker International**

Signature: 

Date: 03/04/2021

Appendix B. Terminology and Conventions

B.1 NUMBERING CONVENTION

Each testing element contains a unique identifier for traceability and configuration management. Test cases and scenarios for all projects in the Smart Columbus program will follow the same numbering convention, each representing an identifiable attribute of the traced metric. The convention is in **Figure 1** and definitions are listed in **Table 21**.

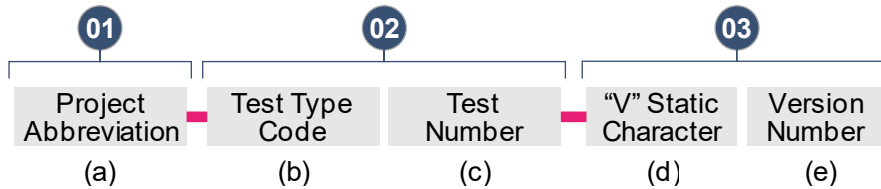


Figure 1: Numbering Convention

Source: City of Columbus

Table 21: Numbering Convention Definitions

Octet	Description	Data Type, Casing	Number of Characters or Digits
Project Abbreviation	The designated Smart Columbus project acronym (i.e., MMTPA)	String, upper case	Variable
Test Type Code	TRA - Traveler I TRB - Traveler II GOH - Gohio Commute SMH - Smart Mobility Hubs WEB - Pivot Web Portal API - Load Testing	String, upper case	3
Test Number	An integer incrementing by one, indicating the number of requirements established.	Integer	3
"V" Static Character	Static letter "V" represents the version for the particular test objective and procedure.	Character	1
Version Number	An integer incrementing by one, indicating the number of revisions made to the test element being traced.	Integer	2

Source: City of Columbus

An example of a test case for the installation of the Pivot app would be MMTPA-TRA001-V01.

1. “MMTPA” is the project abbreviation.
2. “TRA001” is the test type code coupled with the three-digit test number.
3. “V01” is the static “V” coupled with the two-digit version number.

Appendix C. Acronyms and Definitions

Table 22: Acronym List contains project specific acronyms used throughout this document.

Table 22: Acronym List

Abbreviation/Acronym	Definition
API	application programming interface
AVS	Address Verification System
CDC	Center for Disease Control
CFMS	Central Fare Management System
ConOps	Concept of Operations
COTA	Central Ohio Transit Authority
CR	change request
DMP	Data Management Plan
DPP	Data Privacy Plan
EPM	Event Parking Management
GBFS	General Bikeshare Feed Specification
GTFS	General Transit Feed Specification
GUI	graphical user interface
HIPPA	Health Insurance Portability and Accountability Act
ID	test identifier
IDAM	Identity and Access Management
IEEE	Institute of Electrical and Electronics Engineers
IVR	integrated voice response
MDS	Mobility Data Specification

Appendix C. Acronyms and Definitions

Abbreviation/Acronym	Definition
ML	machine learning
MMPA	Multimodal Trip Planning Application
NEMT	non-emergency medical transportation
NFC	near field communication
NIST	National Institute of Standards and Technology
OWASP	Open Web Application Security Project
PHI	protected health information
PII	personally identifiable information
POS	point-of-sale
QR	quick response
RFP	request for proposal
RTM	Requirements Traceability Matrix
SyRS	System Requirements Specification
TNC	transportation network company
UAT [Test Plan]	User Acceptance Testing [Test Plan]

Source: City of Columbus

Appendix D. Glossary

Table 23: Glossary contains project-specific terms used throughout this document.

Table 23: Glossary

Term	Definition
Agile	A method of project management characterized by division of tasks into short phases of work and frequent reassessment and adaptation of plans.
app	Software application.
banked users	Banked users have set up a user account with funds deposited in their account or credit card information saved.
travelers (end users)	The travelers (residents and visitors) in Columbus who will be interacting with the Event Parking Management Central System to view, plan, reserve, and navigate to desired parking.
COTA Central Fare Management System (CFMS)	System implemented through a recently executed contract with SPX/Genfare that will accept various forms of payment including cash, magnetic cards, smart cards, and mobile tickets.
data privacy	The reasonable expectation that data of a sensitive nature will be kept confidential, sanitized, and/or encrypted, and respectfully and responsibly maintained by all Users, managers, and collectors of the data.
data security	The tools, policies, practices, and procedures used to protect data from being accessed, manipulated, or destroyed or being leveraged by those with a malicious intent or without authorization, as well as the corrective actions taken when data breaches are suspected or have been identified.
multimodal transportation	Travel using more than one mode of transportation.
open source	Software developed through open collaboration and voluntary contribution by developers who write and exchange programming code.
personally identifiable information (PII)	Information used in security and privacy laws that can be used to identify an individual, such as vehicle, traveler, and payment information.
push notification	A method used to alert users to relevant information pertaining to a route or selected mode of transportation, such as the approach of a transfer location, congestion or other impediment to travel, or pricing change.

Term	Definition
quick response (QR) barcode	Commonly referred to as a QR code. A barcode that stores information that can be used for marketing or sharing information and can be read using a digital device such as a smartphone.
real-time data	Information delivered immediately after collection.
systems engineering approach	A linear and sequential product or software development model that includes Conception, Initiation, Analysis, Design, Construction, Testing, Production/Implementation and Maintenance phases.
third party	Organizations not affiliated with the Smart Columbus Program.
transportation network company (TNC)	Private businesses, non-profits, and quasi-governmental agencies that offer one or more types of transportation for use in exchange for payment.
trip data	Origin, destination, start time, end time, mode, transfer, transfer time, transfer location, disembarked location, embarked location.
unbanked users	Unbanked users are those who pay for each transaction separately at the time of the trip request.

Source: City of Columbus



THE CITY OF
COLUMBUS^{*}
ANDREW J. GINTHER, MAYOR