



# Smart Mobility Hubs (SMH) Test Report

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for the Smart Columbus  
Demonstration Program

FINAL REPORT | August 5, 2020

Produced by City of Columbus

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# Acknowledgments

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- Central Ohio Transit Authority
- Ohio Department of Transportation
- Columbus Metropolitan Library – Linden Branch
- St. Stephen's Community House
- Columbus State Community College
- Mobility Service Providers
- Orange Barrel Media/IKE Smart City
- Franklin County Emergency Dispatch Center
- Columbus Emergency Dispatch Center
- Clinton Township Administration, Fire Chief's Office, and Police Department



# Abstract

The purpose of this Smart Mobility Hubs Test Report is to document the results of Smart Mobility Hubs system testing conducted prior to launch of Interactive Kiosks and transportation amenities. 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 Smart Mobility Hubs (SMH) system.<sup>1</sup> This Test Report documents the results of the testing procedures introduced in the Test Plan that were used to validate the functionalities of the SMH system. This report summarizes test activities, identifies any issues that occurred during testing, and documents the acceptance of functionalities.

## 1.1. PROJECT BACKGROUND

The SMH project is one of eight projects in the Smart Columbus program. It is designed to foster a community of connections and accessibility by providing increased mobility options and free, easy-to-use trip-planning tools. These design goals reflect needs identified through public outreach surveys of area residents. The SMH project is committed to delivering solutions that help close the first mile/last mile (FMLM) gap.

The project will deploy several transportation amenities at six different facilities, which are the SMHs:

- Columbus State Community College (CSCC)
- Central Ohio Transit Authority (COTA) Linden Transit Center
- St. Stephen's Community House
- COTA Northern Lights Park & Ride
- Columbus Metropolitan Library – Linden Branch
- COTA Easton Transit Center

The transportation amenities at the SMHs work together to deliver mobility as a service (MaaS). MaaS provides travelers with new and consolidated transportation options to move about the region using various modes, with a focus on empowering residents by using information and technology to provide waiting areas with real-time transit information, microtransit connections for pedestrians, seamless transfer between modes, and local information on points of interest to encourage city exploration.

## 1.2. PROJECT OBJECTIVES

Smart Columbus partnered with public and private agencies with a shared central focus on enhancing user experience, quality of life, and customer satisfaction. Reaching the project's intermediate goals and objectives will signal progress toward reaching successful outcomes. Performance will be evaluated by collecting trip-generated data, application usage, and user surveys and evaluations. Two primary objectives Smart Columbus will monitor and measure are:

- Mobility – Improve physical access to multimodal trip planning and payment options

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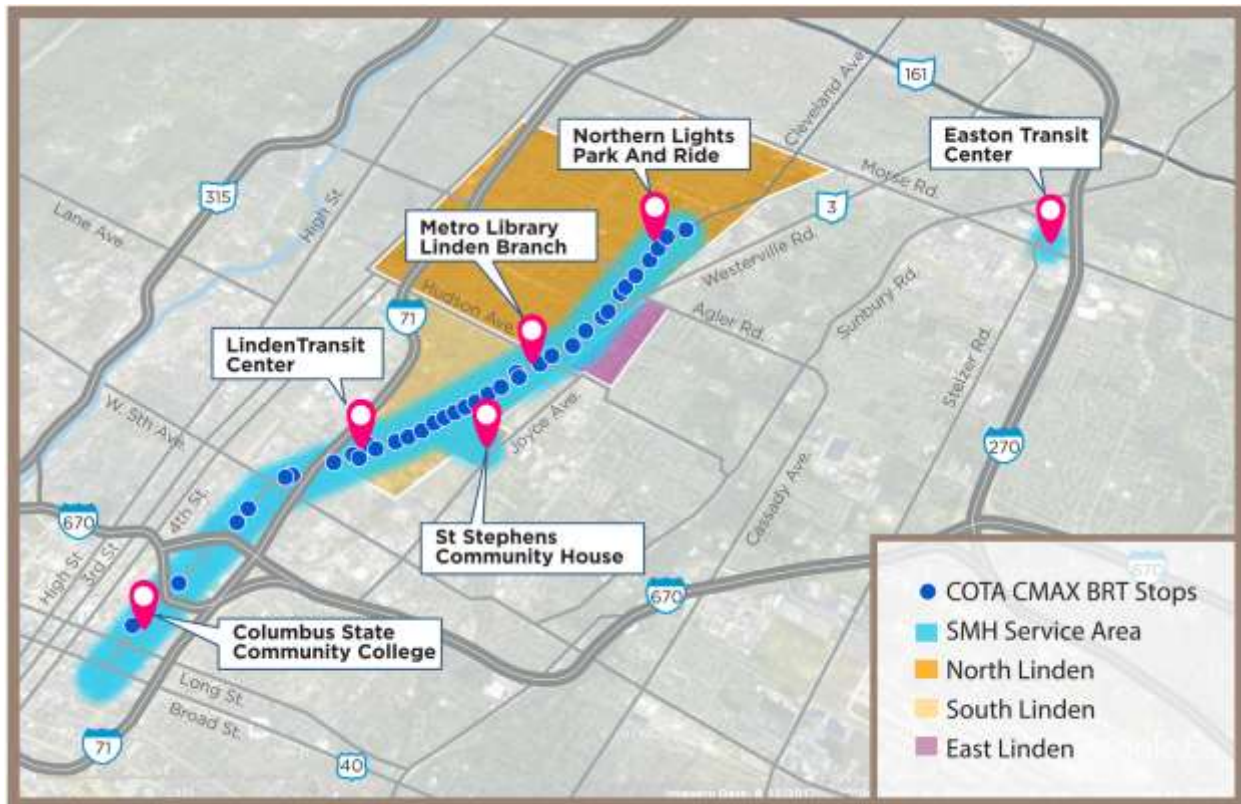
<sup>1</sup> <https://d2rfd3nxvhnf29.cloudfront.net/2020-03/SCC-B-SMH-MTP-FINAL-20191011.pdf>

- Customer satisfaction – Improve customer satisfaction

Benefits to the transportation system of realizing these key objectives include enhanced integration and connectivity across and between modes. A benefit to the surface transportation system will be increased efficiency. Benefits for travelers would be having better access to the system and increased mobility.

### 1.3. PROJECT CONCEPT

**Figure 1** shows the geographic service area for the SMH facilities. The project area extends on the Cleveland Avenue corridor, coinciding with COTA’s bus rapid transit (BRT) service (called “CMAX”), from CSCC to the Easton Transit Center. Site-specific amenities are offered along the route. Individual SMH facilities will vary in size, configuration, and available services to incorporate amenities within existing physical constraints.



**Figure 1: Smart Mobility Hub Locations**

Source: Google Earth Pro, City of Columbus

The project has deployed the amenities listed in **Table 1**.

Table 1: Smart Mobility Hub System Amenities

Location	Amenities												
	Interactive Kiosk	Wi-Fi	Park & Ride	Pick-up/Drop-off Zones	Car-Share	Bike-Share	Bike Racks	Dockless Parking	Real-Time Display	Comprehensive Trip-Planning (CTP)	Emergency Call Button (ECB)	Electric Vehicle Charging *	Automated Vehicle (AV) Shuttle **
Columbus State Community College	D	D	-	-	D	E	E	D	E	D	D	-	-
Linden Transit Center	D	E	-	D	-	D	-	D	E	D	D	-	D
Metro Library – Linden Branch	D	D	-	D	D	D	E	D	E	D	D	-	-
Northern Lights Park & Ride	D	D	E	D	D	-	E	D	E	D	D	D	-
St. Stephen's Community House	D	D	-	D	D	D	E	D	-	D	D	-	D
Easton Transit Center	D	E	E	D	-	D	E	-	E	D	D	-	-

**Note:** D = deployed, E = existing, '-' = Not available

\* While defined in the SMH project documents, this will be pursued outside of the scope of this project by the private property owner.

\*\* This is part of the Connected Electric Autonomous Vehicle (CEAV project), another project in the Smart Columbus portfolio.

Source: City of Columbus

## 1.4. TEST COMPONENTS

The following list of components were tested:

- Interactive Kiosk (IK) manufacturing pre-flight verification** – All of the IKs were tested before they were packed and shipped for installation at the SMH sites. **Appendix A** includes the checklist used to test and inspect the kiosks before packing and the test results for each kiosk shipped for installation.
- IK post installation verification** – All of the IKs were inspected to confirm the hardware and software components installed were working as intended. **Appendix B** includes the checklist the vendor used for the inspection and the test results for the post-installation verification of each kiosk.
- IK field support and maintenance** – After installation, daily maintenance inspections will be conducted for all installed SMH kiosks. **Appendix C** includes the checklist to be used for daily inspection. **Table 15** provides the test results for the initial inspection conducted after installation.
- Mobility Infrastructure verification** – Several mobility amenities were installed at the SMH sites. **Table 16** provides test results for the inspection and verification to make sure the constructability standards were followed during installation. Mobility infrastructure elements are:
  - Bike-share docking

- Car-share parking
  - Ride-hailing pick-up/drop-off locations
  - Dockless parking areas for e-bikes and scooters
  - Park & Ride facilities
5. **Agreement verification** – As part of the SMH project, different transportation modes were deployed at SMH sites and IKs were installed, which required the City of Columbus to facilitate agreements between transportation providers, facility owners, and the IK vendor. Policy, security, maintenance, and administration requirements were established through these agreements. **Table 17** lists the agreements parties will follow throughout the period of this project.
  6. **Preliminary testing** – At each SMH site, the IK provides various services, which were tested through multiple test cases. **Table 3** provides the test results summary for:
    - IK Functionality
    - Comprehensive trip-planning (CTP)
    - ECB
    - Wi-Fi services
  7. **Acceptance testing** – Various test scenarios were developed to conduct acceptance testing of the system. Scenarios were composed of a series of test cases used to simulate the system in a real-world operational environment. The test results for the scenarios are summarized in **Table 4**.

## 1.5. REFERENCES

The SMH system is constructed to meet the user needs and features identified in the Concept of Operations (ConOps) documents and the requirements set forth in the System Requirements (SyRS) document. This document is also supported by other systems engineering documents including Interface Control Document, System Design Document and program-wide documents including System Architecture and Standards Plan, Safety Management Plan and Performance Measurement Plan. **Table 2** includes the list of references used to provide additional detail in achieving the outcomes for the project.

**Table 2: References**

Title	Pub. Date
IEEE 829 Test Plan Outline <a href="https://standards.ieee.org/standard/829-2008.html">https://standards.ieee.org/standard/829-2008.html</a>	Jul. 18, 2008
Ohio Manual of Uniform Traffic Control Devices. Ohio Department of Transportation <a href="http://www.dot.state.oh.us/Divisions/Engineering/Roadway/DesignStandards/traffic/OhioMUTCD/Pages/OMUTCD2012_current_default.aspx">http://www.dot.state.oh.us/Divisions/Engineering/Roadway/DesignStandards/traffic/OhioMUTCD/Pages/OMUTCD2012_current_default.aspx</a>	Jan. 13, 2012
Central Ohio Transit Authority (COTA) – Long Range Transit Plan <a href="https://www.cota.com/wp-content/uploads/2016/04/LRTP.pdf">https://www.cota.com/wp-content/uploads/2016/04/LRTP.pdf</a>	April 2016
City of Columbus Americans with Disabilities Act (ADA) Rules and Regulations <a href="https://www.columbus.gov/publicservice/Design-and-Construction/document-library/Curb-Ramp-Construction/">https://www.columbus.gov/publicservice/Design-and-Construction/document-library/Curb-Ramp-Construction/</a>	April 1, 2018
Traffic Signal Design Manual. City of Columbus, Department of Public Service <a href="https://www.columbus.gov/WorkArea/DownloadAsset.aspx?id=2147506380">https://www.columbus.gov/WorkArea/DownloadAsset.aspx?id=2147506380</a>	Oct. 1, 2018

Title	Pub. Date
IKE Smart City applications <a href="https://www.ikesmartcity.com/#applications">https://www.ikesmartcity.com/#applications</a>	
Smart Columbus Demonstration Program Smart Mobility Hubs System Requirements <a href="https://d2rfd3nxvhnf29.cloudfront.net/2019-06/SCC-B-SMH-SyRS-FINAL-v2.pdf">https://d2rfd3nxvhnf29.cloudfront.net/2019-06/SCC-B-SMH-SyRS-FINAL-v2.pdf</a>	Nov 15, 2018
Smart Columbus Demonstration Program Smart Mobility Hubs Interface Control Document <a href="https://d2rfd3nxvhnf29.cloudfront.net/2019-06/SCC-B-SMH-ICD-FINAL-v2.pdf">https://d2rfd3nxvhnf29.cloudfront.net/2019-06/SCC-B-SMH-ICD-FINAL-v2.pdf</a>	Feb 15, 2019
Smart Columbus Demonstration Program Smart Mobility Hubs System Design Document <a href="https://d3hzplpmmz6qe4.cloudfront.net/2019-07/Smart%20Mobility%20Hubs%20System%20Design%20Document.pdf">https://d3hzplpmmz6qe4.cloudfront.net/2019-07/Smart%20Mobility%20Hubs%20System%20Design%20Document.pdf</a>	May 29, 2019
Smart Columbus Demonstration Program Performance Measurement Plan <a href="https://d2rfd3nxvhnf29.cloudfront.net/2019-08/Smart%20Columbus%20Performance%20Measurement%20Plan.pdf">https://d2rfd3nxvhnf29.cloudfront.net/2019-08/Smart%20Columbus%20Performance%20Measurement%20Plan.pdf</a>	Jun 1, 2019
Smart Columbus Demonstration Program Smart Mobility Hubs Master Test Plan <a href="https://d2rfd3nxvhnf29.cloudfront.net/2020-03/SCC-B-SMH-MTP-FINAL-20191011.pdf">https://d2rfd3nxvhnf29.cloudfront.net/2020-03/SCC-B-SMH-MTP-FINAL-20191011.pdf</a>	Oct 11, 2019
Smart Columbus Demonstration Program Safety Management Plan <a href="https://d2rfd3nxvhnf29.cloudfront.net/2020-03/SCC-F-Safety%20Management%20Plan_12-05-2019_FINAL.PDF">https://d2rfd3nxvhnf29.cloudfront.net/2020-03/SCC-F-Safety%20Management%20Plan_12-05-2019_FINAL.PDF</a>	Dec 5, 2019
Smart Columbus Demonstration Program Smart Mobility Hubs Concept of Operations <a href="https://d2rfd3nxvhnf29.cloudfront.net/2020-03/SCC-B-SMH-ConOps-Update-Final-20191224.pdf">https://d2rfd3nxvhnf29.cloudfront.net/2020-03/SCC-B-SMH-ConOps-Update-Final-20191224.pdf</a>	Dec 27, 2019
Smart Columbus Demonstration Program System Architecture and Standards Plan <a href="https://d2rfd3nxvhnf29.cloudfront.net/2020-06/SCC-B-SASP-UPDATED_4_9_2020%20-%20final.pdf">https://d2rfd3nxvhnf29.cloudfront.net/2020-06/SCC-B-SASP-UPDATED_4_9_2020%20-%20final.pdf</a>	Apr 22, 2020
Smart Columbus Demonstration Program Demonstration Site Map and Installation Plan <a href="https://d2rfd3nxvhnf29.cloudfront.net/2020-07/SCC-B-DSP%26IS-UPDATED.pdf">https://d2rfd3nxvhnf29.cloudfront.net/2020-07/SCC-B-DSP%26IS-UPDATED.pdf</a>	Jun 19, 2020

Source: City of Columbus

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

<sup>2</sup> [www.smart.columbus.gov](http://www.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 status 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. Pass – 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. Fail – 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 SMH elements can be found in the SMH Master Test Plan.<sup>3</sup>

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<sup>3</sup> <https://d2rfd3nxvhnf29.cloudfront.net/2020-03/SCC-B-SMH-MTP-FINAL-20191011.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, Orange Barrel Media/IKE Smart City and other stakeholders.

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

- **Section 3.1.1, Table 3** provides the preliminary testing test results
- **Section 3.1.2, Table 4** provides the acceptance testing test results
- **Appendix A, Table 13** provides the IK manufacturing pre-flight test results
- **Appendix B, Table 14** provides the IK post-installation test results
- **Appendix C, Table 15** provides the IK filed support and maintenance test results
- **Appendix D, Table 16** provides the mobility infrastructure inspection test results
- **Appendix E, Table 17** provides the SMH agreement verification review results

### 3.1.1. Preliminary Testing

The test cases listed below focus on testing the system requirements, interfaces, data, and system design for the IK system. This section identifies the test results for each test case. Each of the test case is tested at SMH locations listed under column 'SMH Test Locations' identified in the table below. All functions were tested under leadership of the system owner, test manager, and technical tester, 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.

**Table 3** is a detailed log of the results of testing each case. 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**.

**Table 3: Test Case Results Matrix**

TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-CTP001-V01	Verify user is able to locate and open the Pivot app on the IK touchscreen interface.	Comprehensive Trip Planning	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden Branch Northern Lights Park and Ride Easton Transit Center	DESCRIPTION User is able to locate and open the Pivot app on the kiosk.  PROCEDURE • User touches the screen on the kiosk to begin. • User locates and opens the Pivot app.  EXPECTED RESULTS • Find and open the pivot app on the kiosk.	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020 - 2/12/2020	Passed	

TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-CTP002-V01	User is able to plan a trip using the Pivot app on the kiosk.	Comprehensive Trip Planning	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p><b>DESCRIPTION</b> User plans a trip through the Pivot app on the kiosk without an account to the Pivot app.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• User touches the IK screen to exit the stand-by mode.</li> <li>• Open the "Pivot" app on the touchscreen, click on the human icon on the top left corner of the app click "continue as guest".</li> <li>• Enter the address to destination in the "where to" tab and select from the drop-down list of suggested addresses.</li> <li>• User can enter the address, the name of the destination or set the location on the map.</li> <li>• Identify and open the settings icon on the right top corner of the screen to edit language, results preferences and preferred modes as needed.</li> <li>• Route options will be presented for the user to review and choose based on the transportation preferences selected.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• App provides directions to the destination entered and by preferred modes of transportation.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020 - 2/12/2020	Passed	

TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-CTP003-V01	Verify that Pivot app provides route options when user selects ride-hailing as preferred mode under settings.	Comprehensive Trip Planning	Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p><b>DESCRIPTION</b> User plans a trip by selecting ride-hailing as a travel mode.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• User touches the IK screen to begin.</li> <li>• Open the "Pivot" app, click on the human icon on the left top corner of the app and click 'continue as guest'.</li> <li>• Enter the address to destination in the "where to" tab and select from the drop-down list of suggested addresses.</li> <li>• User can enter the address, the name of the destination or set the location on the map.</li> <li>• Identify and open the settings icon on the right top corner of the screen.</li> <li>• Click Preferred modes under Transportation preferences and select ride hail option as the preferred mode.</li> <li>• App to provide route options using ride-hailing.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• App allows user to select ride-hailing as the preferred mode under transportation preferences in settings.</li> <li>• App provides route options using ride-hailing as the service.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/12/2020	Passed	No dedicated ride-hailing zone at Columbus State Community College SMH location.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-CTP004-V01	Verify that Pivot app provides route options when user selects bike-sharing as preferred mode under settings.	Comprehensive Trip Planning	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Easton Transit Center	<p><b>DESCRIPTION</b> User plans a trip by selecting bike-share as a travel mode.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• User touches the IK screen to begin.</li> <li>• Open the "Pivot" app, click on the human icon on the left top corner of the app and click "continue as guest".</li> <li>• Enter the address to destination in the "where to" tab and select from the drop-down list of suggested addresses.</li> <li>• User can enter the address, the name of the destination or set the location on the map.</li> <li>• Identify and open the settings icon on the right top corner of the screen.</li> <li>• Click Preferred modes under Transportation preferences, select "BIKE" option and select "COGO".</li> <li>• App to provide route options using bike-sharing.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• App allows user to select bike-sharing as the preferred mode under transportation preferences in settings.</li> <li>• App provides route options using bike-sharing as the transportation mode.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/17/2020	Passed	Bike-share not available at Northern Lights Park and Ride.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-CTP005-V01	Verify that Pivot app provides route options when user selects scooter as preferred mode under settings.	Comprehensive Trip Planning	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride	<p><b>DESCRIPTION</b> User plans a trip by selecting scooter as a travel mode.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• User touches the IK screen to begin.</li> <li>• Open the "Pivot" app, click on the human icon on the left top corner of the app and click "continue as guest".</li> <li>• Enter the address to destination in the "where to" tab and select from the drop-down list of suggested addresses.</li> <li>• User can enter the address, the name of the destination or set the location on the map.</li> <li>• Identify and open the settings icon on the right top corner of the screen.</li> <li>• Click Preferred modes under Transportation preferences, select "Scooter" and select "LIME", "BIRD", and "SPIN".</li> <li>• App to provide route options using scooter.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• App allows user to select scooter as the preferred mode under transportation preferences in settings.</li> <li>• App provides route options using scooter as the mode of travel.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/12/2020	Passed	Scooter mode is not available at Easton Transit Center.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-CTP006-V01	Verify that Pivot app provides route options when user selects car-sharing as preferred mode under settings.	Comprehensive Trip Planning	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p><b>DESCRIPTION</b> User plans a trip by selecting car-share as a travel mode.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• User touches the IK screen to begin.</li> <li>• Open the "Pivot" app, click on the human icon on the left top corner of the app and click "continue as guest".</li> <li>• Enter the address to destination in the "where to" tab and select from the drop-down list of suggested addresses.</li> <li>• User can enter the address, the name of the destination or set the location on the map.</li> <li>• Identify and open the settings icon on the right top corner of the screen to edit results preferences.</li> <li>• Click Preferred modes under Transportation preferences and select car-share option as the preferred mode.</li> <li>• App to provide route options using car-sharing.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• App allows user to select car-sharing as the preferred mode for the transportation options.</li> <li>• App provides route options using car-sharing as the service.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Deferred	Car-sharing is not integrated into Pivot because there is no car-sharing mobility provider yet.  Defect DFT001 logged. Defect DFT001 deferred.
SMH-CTP007-V01	Validate that the IK will send Global Positioning System (GPS) information of the location to Pivot app.	Comprehensive Trip Planning	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p><b>DESCRIPTION</b> Verify that the current location in the Pivot app is accurate.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• User touches the IK screen to begin.</li> <li>• Open the "Pivot" app, click on the human icon on the left top corner of the app click "continue as guest".</li> <li>• Enter the address to destination in the "where to" tab and select from the drop-down list of suggested addresses.</li> <li>• User can enter the address, the name of the destination or set the location on the map.</li> <li>• User to make sure current location shown on the app is correct.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• Pivot app has the correct current location information to accurately provide directions to the destination.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	

TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-ECB001-V01	Verify when user pushes the ECB, the ECB system establishes a bidirectional voice-enabled communication medium and user is able to communicate with the Emergency Call Center (ECC) from the IK.	Emergency Call Button	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p>DESCRIPTION When user hits the ECB, user is able to communicate with the emergency call operator.</p> <p>PROCEDURE • User locates the ECB • User pushes the ECB to activate. • User able to communicate with the Emergency call operator.</p> <p>EXPECTED RESULTS • User should be able to interact with the emergency call operator after ECB is pushed.</p>	System Owner, Test Manager, Traveler, Technical Tester, Dispatcher	2/5/2020- 2/12/2020	Passed	<p>ECB panel is not installed at St. Stephen's Community House.</p> <p>Defect DFT003 logged.</p> <p>6/26/2020: ECB Panel installed and tested at St. Stephen's Community House.</p> <p>Defect DFT003 resolved.</p>
SMH-ECB002-V01	Verify when an ECB is activated by the user; the ECB system activates the IK camera and records video to the local DVR and IKE can retrieve the video.	Emergency Call Button	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p>DESCRIPTION When user hits the ECB, the DVR should record video for retrieval.</p> <p>PROCEDURE • Tester to follow the steps listed under SMH-ECB001-V01. • Tester will request the video recording from the IK vendor.</p> <p>EXPECTED RESULTS • Tester should be able to retrieve the video from IKE.</p>	Test Manager, Traveler, Technical Tester, Data Producer	2/5/2020- 2/17/2020	Passed	<p>ECB panel is not installed at St. Stephen's Community House.</p> <p>Defect DFT003 logged.</p> <p>6/26/2020: ECB Panel installed and tested at St. Stephen's Community House.</p> <p>Defect DFT003 resolved.</p>
SMH-ECB003-V01	Verify when an ECB is in an inactive mode, the IK camera is not activated.	Emergency Call Button	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p>DESCRIPTION When no ECB activation has occurred, no video recording is taking place.</p> <p>PROCEDURE • Tester to follow the steps listed under SMH-ECB002-V01. • Tester to make sure no video is recorded when the ECB was not active.</p> <p>EXPECTED RESULTS • No video should be recorded when the ECB is an inactive mode.</p>	Test Manager, Traveler, Technical Tester, Data Producer	2/17/2020	Cancelled	<p>ECB video will be in recording mode 24x7x365 at all SMH locations. Reviewed this test case with the vendor. System video is recorded all the time for security and analytics purposes, therefore, this test case is cancelled</p> <p>Defect logged DT002. Defect DFT002 Closed.</p> <p>ECB panel is not installed at St. Stephen's Community House.</p> <p>Defect DFT003 logged.</p> <p>6/26/2020: ECB Panel installed and tested at St. Stephen's Community House.</p> <p>Defect DFT003 resolved.</p>

TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-ECB004-V01	Verify that user is able to alert the ECC officials in an emergency situation through the ECB interface at the IK.	Emergency Call Button	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p><b>DESCRIPTION</b> User hits the ECB in an emergency situation to alert ECC officials.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• User locates the ECB.</li> <li>• User pushes the ECB to activate.</li> <li>• User able to communicate with the emergency call operator and alert them with the situation.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• User is able to communicate with emergency officials during an emergency situation.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester, Dispatcher	2/5/2020- 2/12/2020	Passed	<p>ECB panel is not installed at St. Stephen's Community House.</p> <p>Defect DFT003 logged.</p> <p>6/26/2020: ECB Panel installed and tested at St. Stephen's Community House.</p> <p>Defect DFT003 resolved.</p>
SMH-ECB005-V01	Verify that the IK-Central Management System (CMS) records the time, date, and location upon ECB activation.	Emergency Call Button	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p><b>DESCRIPTION</b> When user hits the ECB, user should be able to communicate with the emergency call operator.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• Tester to follow the steps listed under SMH-ECB002-V01</li> <li>• Tester to make note of the date and time when the ECB button was activated.</li> <li>• Tester will request for the logged data of all times the ECB was active from the IK vendor.</li> <li>• Tester to make sure that logged date, time and location match with the date, time and location the test was conducted at that location.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• Tester should be able to match the date, time and location of logged data with the date, time and location when the ECB was tested at that location.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester, Data Producer	2/20/2020	Passed	<p>ECB panel is not installed at St. Stephen's Community House.</p> <p>Defect DFT003 logged.</p> <p>6/26/2020: ECB Panel installed and tested at St. Stephen's Community House.</p> <p>Defect DFT003 resolved.</p>
SMH-ECB006-V01	Verify that the ECB system is capable of transmitting GPS location coordinates to the ECC to notify dispatchers of location of the help request.	Emergency Call Button	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p><b>DESCRIPTION</b> Emergency call operator to know the location of the user through the GPS of the ECB system.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• User locates the emergency call button.</li> <li>• User pushes the ECB.</li> <li>• Communicates with the emergency call operator and operator identifies the location by GPS and confirms with the user.</li> <li>• User to confirm the location.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• Emergency call operator to identify the correct location of the user through ECB system GPS.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester, Data Producer, Dispatcher	2/5/2020- 2/12/2020	Passed	<p>ECC officials were able to confirm the address of the call location.</p> <p>ECB panel is not installed at St. Stephen's Community House.</p> <p>Defect DFT003 logged.</p> <p>6/26/2020: ECB Panel installed and tested at St. Stephen's Community House.</p> <p>Defect DFT003 resolved.</p>



TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-IKE001-V01	Validate and verify the data exchange over the interface(s) between the IK-CMS and OS.	Interactive Kiosk	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p>DESCRIPTION Verify data exchange is accurate between OS and IK-CMS.</p> <p>PROCEDURE</p> <ul style="list-style-type: none"> <li>• Tester to access OS database and IK-CMS database.</li> <li>• Verify the data exchange takes place between the OS and IK-CMS.</li> <li>• Verify the data exchange between OS and IK-CMS is accurate.</li> </ul> <p>EXPECTED RESULTS</p> <ul style="list-style-type: none"> <li>• Tester to verify the data exchange takes place between the systems.</li> <li>• Testers to verify the accuracy of data transfer between OS and IK-CMS.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester		Passed	<p>OS Administrator has access to IK-CMS Web-based dashboard. This will be tested after the API interface is established between IK-CMS and OS.</p> <p>Defect DFT004 logged. 3/25//2020: API established between IK-CMS and OS. Defect DFT004 resolved.</p>
SMH-IKE002-V01	Verify that user is able to select the language of choice (English or Spanish) at the kiosk	Interactive Kiosk	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p>DESCRIPTION User selects the language of choice (English or Spanish) at the kiosk.</p> <p>PROCEDURE</p> <ul style="list-style-type: none"> <li>• User touches the screen on the kiosk to exit stand-by mode of the kiosk.</li> <li>• Click "Language" tab on the screen.</li> <li>• Select preferred language.</li> </ul> <p>EXPECTED RESULTS</p> <ul style="list-style-type: none"> <li>• User should be able to locate the language options.</li> <li>• Select language preferences (English or Spanish) at the kiosk.</li> <li>• Language on the apps should change to the language selected.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	
SMH-IKE003-V01	Verify the IK system resets back to English after one minute of inactivity.	Interactive Kiosk	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p>DESCRIPTION Language on the kiosk change to English after one minute of inactivity.</p> <p>PROCEDURE</p> <ul style="list-style-type: none"> <li>• Perform SMH-IKE002-V01</li> <li>• User to make no clicks on the IK touch screen for a minute.</li> <li>• Screen changes to ad loop.</li> <li>• User touches the screen again on the kiosk to begin.</li> <li>• Language shown on the icons should be English.</li> </ul> <p>EXPECTED RESULTS</p> <ul style="list-style-type: none"> <li>• Language on the icons should default to English after one minute of inactivity.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	

TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-IKE004-V01	Verify that the IK maintains English as the default language.	Interactive Kiosk	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p><b>DESCRIPTION</b> Language on the kiosk should be English when the user session begins.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• User touches the screen on the kiosk to exit stand-by mode.</li> <li>• Verify that the language on the screen is English.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• Language on the icons should be in English when the users starts a session.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	
SMH-IKE005-V01	Verify that a traveler with ADA requirements can access IK controls and apps on the touchscreen.	Interactive Kiosk	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p><b>DESCRIPTION</b> Touchscreen interface and its controls adjust to the height as per the ADA requirements.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• User touches the screen on the kiosk to begin.</li> <li>• Click on the wheelchair icon located on the bottom left corner of the screen.</li> <li>• Height of controls and IK apps adjust as per the ADA requirements.</li> </ul> <p><b>EXPECTED RESULTS</b> Person with ADA requirements should be able to access all controls and app provided on the IK.</p>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	
SMH-IKE006-V01	Where source data is not available in real-time, verify the touchscreen utilizes portable document format (PDF) and/or service board websites in the short term such as transit route maps, location-specific services or tourism information, etc.	Interactive Kiosk	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p><b>DESCRIPTION</b> User looks for static transit map when there is no internet connectivity.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• Tester to turn off the modem at the kiosk.</li> <li>• Touch the IK screen to exit the stand-by mode.</li> <li>• Open the "COTA System Map" app on the touchscreen.</li> <li>• Transit map options will be presented for the user to review.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• Application to provide offline transit map access to the user.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	Overview map of COTA System Map is added to the IK.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-IKE007-V01	Verify that the kiosk provides instructions to the user to exit standby mode.	Interactive Kiosk	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p>DESCRIPTION User is able to locate instructions on how to access the kiosk when in a stand-by mode.</p> <p>PROCEDURE • User to approach the kiosk. • Top panel of the kiosk to say, "TOUCH SCREEN TO BEGIN". • User is able to locate and read the instructions without any difficulty.</p> <p>EXPECTED RESULTS • User is able to locate and read the instructions to activate the screen without any difficulty.</p>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	
SMH-IKE008-V01	Verify all hardware undergoes factory acceptance, installation, and performance testing procedures.	Interactive Kiosk	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	Refer to <b>Appendix A</b> for IKE manufacturing pre-flight checklist test result summary.	Test Manager, Kiosk System Administrator	12/15/2019	Passed	
SMH-IKE009-V01	Verify the IK system detects and automatically notifies the IK system when modem is offline	Interactive Kiosk Administration	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p>DESCRIPTION IK system administrator gets an alert when modem on the kiosk is offline.</p> <p>PROCEDURE • Tester to turn modem offline installed at the kiosk location. • Verify that the IK system administrator receives an alert.</p> <p>EXPECTED RESULTS • IK system administrator gets an alert when modem is offline.</p>	Test Manager, Kiosk System Administrator	2/20/2020	Passed	
SMH-IKE010-V01	Verify the IK system detects and automatically notifies the IK system administrator (operating vendor) when it is unable to send/receive data.	Interactive Kiosk Administration	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p>DESCRIPTION IK system administrator is notified when the modem on the kiosk is offline and doesn't receive any usage data from the IK to IK-CMS.</p> <p>PROCEDURE • Tester to turn modem offline installed at the kiosk location. • Verify that the IK system administrator receives an alert. • Verify the data received from the IK to IK-CMS.</p> <p>EXPECTED RESULTS • The IK system administrator gets an alert when it is unable to send/receive data from the IK.</p>	Test Manager, Kiosk System Administrator	2/20/2020	Passed	

TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-IKE011-V01	Verify the IK system detects and automatically notifies the IK system administrator (operating vendor) when invalid or missing data has been detected.	Interactive Kiosk Administration	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p><b>DESCRIPTION</b> IK system administrator gets an alert when user tries to access invalid data through the kiosk.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• IK system administrator changes the URL for the destination of the Pivot app.</li> <li>• Tester opens Pivot app.</li> <li>• IK system administrator is notified with an alert when attempted to access invalid data at the kiosk.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• IK system administrator to receive an alert about accessing invalid data at a kiosk.</li> <li>• Alert to also contain unique identifier which can identify the kiosk location.</li> </ul>	Test Manager, Kiosk System Administrator	2/21/2020	Passed	IK-CMS provided a healthy check error – "COTA PIVOT could not be retrieved"
SMH-IKE012-V01	Verify the IK touchscreen interface maintains a unique identifier for each IK to diagnose system malfunctions, provides information to the ECB service, as well as customize content per SMH location (location awareness).	Interactive Kiosk Administration	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p><b>DESCRIPTION</b> IK system administration to verify each IK has unique identifier through the interface.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• Tester to turn modem offline.</li> <li>• Verify that the IK system administrator received an alert.</li> <li>• Verify that the alert is identified by a unique identifier to identify location of the malfunction.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• IK system administrator gets an alert along with a unique identifier that is used for each kiosk when there is any malfunction at the kiosk.</li> <li>• Unique identifier should match with the kiosk unique identifier when IK system administrator receives an alert about a system malfunction.</li> </ul>	Test Manager, Traveler, Technical Tester, Kiosk System Administrator	2/17/2020	Passed	
SMH-IKE013-V01	Verify the IK touchscreen provides users with a link to display any current alerts that describe events having a significant impact on transportation services.	Interactive Kiosk App Content	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p><b>DESCRIPTION</b> User is able to access travel alerts on the IK.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• User to open the Pivot app on the IK.</li> <li>• User to select "Transit Alerts" within the app.</li> <li>• User is able to view the current alerts within the system.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• User is able to locate and access the travel alerts within Pivot.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	Pivot app on the IK provided Transit alerts.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-IKE014-V01	Verify the IK touchscreen provides users with a link to COTA static maps within the SMH demonstration area.	Interactive Kiosk App Content	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p>DESCRIPTION User able to access COTA maps at the IK.</p> <p>PROCEDURE</p> <ul style="list-style-type: none"> <li>• User exit the stand-by mode by touching the IK screen.</li> <li>• Locate and open "COTA System Map" app on the touch screen interface.</li> </ul> <p>EXPECTED RESULTS</p> <ul style="list-style-type: none"> <li>• User should be able to locate and open the COTA app available on the IK touchscreen interface.</li> <li>• App should navigate to the static maps on the COTA website.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/12/2020	Passed	Static COTA system map is accessible on the IK.
SMH-IKE015-V01	Verify that user has access to only approved apps, services, and features offered through the interactive display, including trip-planning and payment via the Pivot app.	Interactive Kiosk Security	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p>DESCRIPTION Verify that user has only access to apps and features at the IK.</p> <p>PROCEDURE</p> <ul style="list-style-type: none"> <li>• Testers to inspect functionality of all apps and features listed on the IK.</li> <li>• Testers to verify user does not have access to open internet browsing on the kiosk to perform other functions on the kiosk other than using the listed app and features.</li> </ul> <p>EXPECTED RESULTS</p> <ul style="list-style-type: none"> <li>• No access to browser on the touch screen interface for users to access other apps.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	All the apps available on the IK were tested to make sure there is no access to web or internet.
SMH-IKE016-V01	Verify that users don't have access to OS through the IK touchscreen interface.	Interactive Kiosk Security	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p>DESCRIPTION Verify that user does not have administrative access to OS through the IK touchscreen interface.</p> <p>PROCEDURE</p> <ul style="list-style-type: none"> <li>• Testers to inspect functionality of apps and features listed on the IK.</li> <li>• Testers to verify that user does not have administrator access to OS through the IK.</li> </ul> <p>EXPECTED RESULTS</p> <ul style="list-style-type: none"> <li>• No apps at the IK touchscreen interface provide user with administrative access to OS.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	All the apps available on the IK were tested to make sure there is not access OS.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-IKE017-V01	Verify that users don't have access to apps and other data that is not presented through the IK touch screen interface.	Interactive Kiosk Security	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p><b>DESCRIPTION</b> Verify that user has only access to apps and features at the IK.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• Testers to inspect all the app and features listed on the IK.</li> <li>• Testers to verify that user does not have access to other apps and data on the kiosk.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• No access to data on the IK or from the IK-CMS other than what is presented through the apps.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	All the apps available on the IK were tested to make sure there is no access to web or internet.
SMH-WFS001-V01	User is able to connect to Wi-Fi provided through the kiosk on all electronic devices equipped with internet capabilities (phone, tablet, computer).	Wi-Fi Enabled	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p><b>DESCRIPTION</b> User connects to the internet via Wi-Fi at the kiosk on their phone, tablet and computer.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• Open settings on the phone, under Wi-Fi connect to "IKE Free WiFi".</li> <li>• A login page will open to accept terms and conditions and connect to the Wi-Fi.</li> <li>• Check the box to accept terms and conditions and click "CONNECT".</li> <li>• Follow the steps listed above to connect to Wi-Fi on tablet and computer.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• User is able to connect to Wi-Fi on all personal devices and use the internet.</li> <li>• If the user does not accept terms and conditions, user should not be able to connect to the Wi-Fi.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	User was not presented with terms and conditions page and privacy policy page while trying to connect to IKE Wi-Fi.  Defect DFT005 logged. Defect DFT005 resolved.
SMH-WFS002-V01	User accepts the terms and conditions of Wi-Fi usage service, and an active session with internet access is provisioned.	Wi-Fi Enabled	Columbus State Community College Linden Transit Center St. Stephens Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p><b>DESCRIPTION</b> User connects to the internet via Wi-Fi at the kiosk on a phone, tablet or computer.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• Open settings on the phone, under Wi-Fi connect to "IKE Free WiFi".</li> <li>• A login page will open to accept terms and conditions and connect to the Wi-Fi.</li> <li>• Check the box to accept terms and conditions and click "CONNECT".</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• User able to connect to Wi-Fi on all personal devices and use the internet after the terms and conditions are accepted.</li> <li>• If the user does not accept terms and conditions, user should not be able to connect to the Wi-Fi.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	User was not presented with terms and conditions page and privacy policy page while trying to connect to IKE Wi-Fi.  Defect DFT005 logged. Defect DFT005 resolved.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-WFS003-V01	User declines the terms and conditions of Wi-Fi usage service, and an active session with internet access is not provisioned.	Wi-Fi Enabled	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p>DESCRIPTION</p> <p>User connects to the internet via Wi-Fi at the kiosk on a phone, tablet or computer.</p> <p>PROCEDURE</p> <ul style="list-style-type: none"> <li>• Open settings on the phone, under Wi-Fi connect to "IKE Free WiFi".</li> <li>• A login page will open to accept terms and conditions and connect to the Wi-Fi.</li> <li>• User does not click "I agree the Terms &amp; Conditions" and "CONNECT" button is greyed out.</li> </ul> <p>EXPECTED RESULTS</p> <ul style="list-style-type: none"> <li>• User should not be able to connect to the Wi-Fi without accepting the terms and conditions.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	User was not presented with terms and conditions page and privacy policy page while trying to connect to IKE Wi-Fi.  Defect DFT005 logged. Defect DFT005 resolved.
SMH-WFS004-V01	Verify that access to a webpage on a personal device is denied when user tries to access a website that is a violation of Wi-Fi usage policy.	Wi-Fi Enabled	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p>DESCRIPTION</p> <p>Block websites that are a violation of the usage policy when trying to connect on their personal device through IK Wi-Fi.</p> <p>PROCEDURE</p> <ul style="list-style-type: none"> <li>• User has already completed SMH-WFS001-V01.</li> <li>• User attempts to connect to a website on their personal device blacklisted due to terms of service violation. For testing, the website will be www.netflix.com.</li> <li>• User is prevented from accessing the website.</li> </ul> <p>EXPECTED RESULTS</p> <ul style="list-style-type: none"> <li>• User cannot access a site that violates the Wi-Fi usage policy on their personal device.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/12/2020	Passed	
SMH-WFS005-V01	Verify that Wi-Fi technologies terminate a connection if the connection has extended beyond 15 minutes.	Wi-Fi Enabled	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p>DESCRIPTION</p> <p>The active session of Wi-Fi is terminated on a personal device after 15-minutes of connection.</p> <p>PROCEDURE</p> <ul style="list-style-type: none"> <li>• User has already completed SMH-WFS001-V01.</li> <li>• User records the time of connection.</li> <li>• After 15 minutes from the recorded connection time, verify that the Wi-Fi connection has terminated.</li> </ul> <p>EXPECTED RESULTS</p> <ul style="list-style-type: none"> <li>• The Wi-Fi connection terminates 15 minutes after connection is established.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/12/2020	Cancelled	Wi-Fi did not disconnect after 15 min of connectivity. Defect DFT006 logged. System design change CR001 logged. Defect DFT006 closed. CR001 approved.

TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-WFS006-V01	Verify that Wi-Fi technologies present the user with a terms of use page designated by vendor to display the free Wi-Fi terms and conditions of service.	Wi-Fi Enabled	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p>DESCRIPTION User is presented with the terms and conditions when trying to connect to the Wi-Fi at the kiosk.</p> <p>PROCEDURE • Open settings on the phone, under Wi-Fi connect to "IKE Free WiFi". • A login page will open to accept terms and conditions and connect to the Wi-Fi. • Click on "Privacy Policy" and "Acceptable Use Policy" to open the agreements.</p> <p>EXPECTED RESULTS • User should be able to open the "Privacy Policy" and "Acceptable Use Policy" before they accept the terms and conditions.</p>	System Owner, Test Manager, Traveler, Technical Tester	2/12/2020	Passed	User was not presented with terms and conditions page and privacy policy page while trying to connect to IKE Wi-Fi.  Defect DFT005 logged. Defect DFT005 resolved.
SMH-WFS007-V01	To verify that the IK Wi-Fi services permits access to Pivot app on personal wireless device.	Wi-Fi Enabled	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p>DESCRIPTION User is able to open the Pivot app on their personal wireless device.</p> <p>PROCEDURE • Open settings on the phone, under Wi-Fi connect to "IKE Free WiFi". • A login page will open to accept terms and conditions and connect to the Wi-Fi. • Check the box to accept terms and conditions and click "CONNECT". • Open Pivot app with no connection errors.</p> <p>EXPECTED RESULTS • User is able to connect to the Wi-Fi at the kiosk. • Open the pivot app without any errors using the Wi-Fi at the kiosk.</p>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	User was not presented with terms and conditions page and privacy policy page while trying to connect to IKE Wi-Fi.  Defect DFT005 logged. Defect DFT005 resolved.
SMH-WFS008-V01	Wi-Fi technologies shall support a minimum of 10 simultaneously connected devices.	Wi-Fi Enabled	Columbus State Community College Linden Transit Center St. Stephen's Community House Metro Library - Linden March Northern Lights Park and Ride Easton Transit Center	<p>DESCRIPTION Ten devices successfully connect to the Wi-Fi at the kiosk.</p> <p>PROCEDURE • Open settings on the phone, under Wi-Fi connect to "IKE Free WiFi". • A login page will open to accept terms and conditions and connect to the Wi-Fi. • Check the box to accept terms and conditions and click "CONNECT". • Connect Wi-Fi on all ten devices by following steps listed above.</p> <p>EXPECTED RESULTS • All ten devices successfully connect to the Wi-Fi at the same time at one location with no errors.</p>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	User was not presented with terms and conditions page and privacy policy page while trying to connect to IKE Wi-Fi.  Defect DFT005 logged. Defect DFT005 resolved.

Source: City of Columbus



### 3.1.2. Acceptance Testing

Acceptance test scenarios were focused on verifying each of the SMH service options for operational readiness by conducting a set of tests that reflected usage of the system in real-world scenarios. The testers were primarily the City of Columbus, stakeholders, and administrators of the system.

Throughout this process, all bugs, inconsistencies, errors, and so forth detected were captured in the defect management tool and reported to the development team. The development team modified, updated, and enhanced the software as appropriate to address issues that arose during acceptance testing.

Any scenario that failed was re-tested until either it met the expected outcome or a low-risk decision to modify the design was made. **Table 4** is a log of the results of this last segment of testing.

**Table 4: Acceptance Test Scenario Result Matrix**

TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-ATS100-V01	User is able to select the language of preference (English or Spanish) at the kiosk.	Interactive Kiosk	<ul style="list-style-type: none"> <li>▪ Columbus State Community College</li> <li>▪ Linden Transit Center</li> <li>▪ St. Stephen's Community House</li> <li>▪ Metro Library - Linden March</li> <li>▪ Northern Lights Park and Ride</li> <li>▪ Easton Transit Center</li> </ul>	<p><b>DESCRIPTION</b> User selects the language of choice (English or Spanish) at the kiosk.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• User touches the screen on the kiosk to exit stand-by mode of the kiosk.</li> <li>• Click "Language" tab on the screen.</li> <li>• Select preferred language.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• User should be able to locate the language options.</li> <li>• Select language preference (English or Spanish) at the kiosk.</li> <li>• Language on the apps should change to the language selected.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	
SMH-ATS102-V01	User is able to plan a trip and be able to select multiple transportation modes available at the location through the Pivot app at each SMH location.	Mobility Providers at SMH locations	<ul style="list-style-type: none"> <li>▪ Columbus State Community College</li> <li>▪ Linden Transit Center</li> <li>▪ St. Stephen's Community House</li> <li>▪ Metro Library - Linden March</li> <li>▪ Northern Lights Park and Ride</li> <li>▪ Easton Transit Center</li> </ul>	<p><b>DESCRIPTION</b> User plans a trip by selecting preferred modes on the Pivot app at the kiosk.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• Follow test procedures for each mode listed under test cases SMH-CTP003-V01, SMH-CTP004-V01, SMH-CTP005-V01 and SMH-CTP006-V01.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• App allows user to select preferred modes under transportation preferences in settings.</li> <li>• App provides route options.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/17/2020	Passed	
SMH-ATS105-V01	User is able to access COTA static map information through the IK touchscreen interface for bus route and fare information.	Comprehensive Trip Planning Data access	<ul style="list-style-type: none"> <li>▪ Columbus State Community College</li> <li>▪ Linden Transit Center</li> <li>▪ St. Stephen's Community House</li> <li>▪ Metro Library - Linden March</li> <li>▪ Northern Lights Park and Ride</li> <li>▪ Easton Transit Center</li> </ul>	<p><b>DESCRIPTION</b> User able to access COTA overview system map at the IK.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• User exits the stand-by mode by touching the IK screen.</li> <li>• Locate and open "COTA System Map" app on the touch screen interface.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• User should be able to locate and open the COTA app available on the IK touchscreen interface.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/17/2020	Passed	

TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-ATS107-V01	User is able to activate the ECB service by pressing the button located at the kiosk to alert the ECC officials in any emergency.	Emergency Call Button Call activation	<ul style="list-style-type: none"> <li>▪ Columbus State Community College</li> <li>▪ Linden Transit Center</li> <li>▪ Metro Library - Linden March</li> <li>▪ Northern Lights Park and Ride</li> <li>▪ St. Stephen's Community House</li> <li>▪ Easton Transit Center</li> </ul>	<p><b>DESCRIPTION</b> When user hits the ECB, user is able to communicate with the emergency call operator.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• User locates the ECB.</li> <li>• User pushes the ECB to activate.</li> <li>• User is able to communicate with the Emergency call operator.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• User should be able to interact with the emergency call operator after ECB is pushed.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester, Dispatcher	2/5/2020- 2/12/2020	Passed	
SMH-ATS108-V01	User is able to use the ECB service 24 hours a day, seven days a week, 365 days a year.	Emergency Call Button 24x7x365 ECB service	<ul style="list-style-type: none"> <li>▪ Columbus State Community College</li> <li>▪ Linden Transit Center</li> <li>▪ Metro Library - Linden March</li> <li>▪ Northern Lights Park and Ride</li> <li>▪ Easton Transit Center</li> </ul>	<p><b>DESCRIPTION</b> ECB is available service 24 hours a day, seven days a week, 365 days a year.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• User locates the ECB.</li> <li>• User pushes the ECB to activate.</li> <li>• User is able to communicate with the Emergency call operator.</li> <li>• Refer to Appendix E, Req ID - SMH-AR2318-V01.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• User should be able to interact with the emergency call operator after ECB is pushed.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester Dispatcher	2/5/2020- 2/17/2020	Passed	
SMH-ATS110-V01	Verify that users are able to connect to Wi-Fi on their wireless device when in close proximity to the kiosk.	Wi-Fi Accessibility <ul style="list-style-type: none"> <li>• Wireless internet</li> </ul>	<ul style="list-style-type: none"> <li>▪ Columbus State Community College</li> <li>▪ Linden Transit Center</li> <li>▪ St. Stephen's Community House</li> <li>▪ Metro Library - Linden March</li> <li>▪ Northern Lights Park and Ride</li> <li>▪ Easton Transit Center</li> </ul>	<p><b>DESCRIPTION</b> User connects to the internet via Wi-Fi at the kiosk on a phone, tablet or computer.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• Open settings on the phone, under Wi-Fi connect to "IKE Free WiFi".</li> <li>• A Log In page will open to accept terms and conditions and connect to the Wi-Fi.</li> <li>• Click "Get the Mobile Content".</li> <li>• Follow the steps listed above to connect to Wi-Fi on tablet and computer.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• User is able to connect to Wi-Fi on all devices and use the internet.</li> <li>• If the user does not accept terms and conditions, user should not be able to connect to the Wi-Fi.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	

TEST CASE ID	TEST OBJECTIVE	FUNCTION	SMH TEST LOCATIONS	TEST PROCEDURE	TESTER ROLE	DATE RUN	TEST STATUS	TESTING COMMENT
SMH-ATS111-V01	User is able to login to Pivot app account on a personal device using the Wi-Fi internet access at the kiosk.		<ul style="list-style-type: none"> <li>▪ Columbus State Community College</li> <li>▪ Linden Transit Center</li> <li>▪ St. Stephen's Community House</li> <li>▪ Metro Library - Linden March</li> <li>▪ Northern Lights Park and Ride</li> <li>▪ Easton Transit Center</li> </ul>	<p><b>DESCRIPTION</b> User is able to open the Pivot app on their personal device.</p> <p><b>PROCEDURE</b></p> <ul style="list-style-type: none"> <li>• Open settings on the phone, under Wi-Fi connect to "IKE Free WiFi".</li> <li>• A Log In page will open to accept terms and conditions and connect to the Wi-Fi.</li> <li>• Click "Get the Mobile Content".</li> <li>• Open Pivot app with no connection errors.</li> </ul> <p><b>EXPECTED RESULTS</b></p> <ul style="list-style-type: none"> <li>• User is able to connect to the Wi-Fi at the kiosk.</li> <li>• Open the pivot app without any errors using the Wi-Fi at the kiosk.</li> </ul>	System Owner, Test Manager, Traveler, Technical Tester	2/5/2020- 2/12/2020	Passed	
SMH-ATS112-V01	User is able to locate the designated pick-up and drop-off zones provided at all SMH locations except for Columbus State Community College location.	Ride-Hailing	<ul style="list-style-type: none"> <li>▪ Linden Transit Center</li> <li>▪ St. Stephen's Community House</li> <li>▪ Metro Library - Linden March</li> <li>▪ Northern Lights Park and Ride</li> <li>▪ Easton Transit Center</li> </ul>	<b>Table 16</b> provides the test results of signage installed to locate designated pick-up and drop-off zones at SMH locations except for Columbus State Community College SMH location.	System Owner, Test Manager, Traveler, Technical Tester	12/6/2019- 2/12/2020	Passed	
SMH-ATS113-V01	User is able to locate designated car-share parking zones at designated SMH locations.	Car-Share	<ul style="list-style-type: none"> <li>▪ Columbus State Community College</li> <li>▪ Linden Transit Center</li> <li>▪ St. Stephen's Community House</li> <li>▪ Metro Library - Linden March</li> <li>▪ Northern Lights Park and Ride</li> <li>▪ Easton Transit Center</li> </ul>	<b>Table 16</b> provides the test results of signage installed to locate designated car-sharing zones at SMH locations.	System Owner, Test Manager, Traveler, Technical Tester	12/6/2019- 2/12/2020	Passed	
SMH-ATS114-V01	User is able to locate designated dockless parking zones (scooters, ebikes and dockless bicycles) provided for parking dockless devices with marked pavement markings and signage (all locations except Easton Transit Center).	Dockless Parking	<ul style="list-style-type: none"> <li>▪ Columbus State Community College</li> <li>▪ Linden Transit Center</li> <li>▪ St. Stephen's Community House</li> <li>▪ Metro Library - Linden March</li> <li>▪ Northern Lights Park and Ride</li> </ul>	<b>Table 16</b> provides the test results of signage and pavement markings installed to locate designated dockless parking zones at SMH locations.	System Owner, Test Manager, Traveler, Technical Tester	12/6/2019- 2/12/2020	Passed	

Source: City of Columbus

## 3.2. 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** provides an overview of the defects captured and closed or resolved during testing.

Table 5: Defect Management Matrix

DEFECT NO.	DEFECT DESCRIPTION	SEVERITY	DEFECT STATUS	TEST ID	RESOLUTION DESCRIPTION	COMMENTS
DFT001	Car-share mode not available at all SMH locations due to no mobility provider.	Medium	Deferred	SMH-CTP006-V01 SMH-ATS113-V01	Defect confirmed. Will be updated when car-share mobility providers are confirmed.	Parking spaces are prepared for car-share for when it becomes available.
DFT002	Video cameras are recording video at all times for safety and analytics purposes and not just when the ECB is activated.	Low	Closed	SMH-ECB003-V01	Defect confirmed. Issue discussed with the vendor and the system is configured to record video at all times for analytics and safety. Project team has decided to move forward with no change to existing condition. Defect closed.	
DFT003	ECB not available at St. Stephen's Community House. ECB panel at that SMH location not installed.	High	Resolved	SMH-ECB001-V01 to SMH-ECB006-V01	03/20/2020 - Defect confirmed. ECB is not installed at St. Stephen's Community House.  06/26/2020 - ECB panel is installed at this SMH location. All ECB related test cases were tested and passed.	ECB Panel is installed at the St. Stephen's Community House. All ECB related test cases were tested at this SMH locations. All test cases passed at this location.

DEFECT NO.	DEFECT DESCRIPTION	SEVERITY	DEFECT STATUS	TEST ID	RESOLUTION DESCRIPTION	COMMENTS
DFT004	Interface between OS and IK-CMS is currently not established yet.	High	Resolved	SMH-IKE001-V01	Defect confirmed. OS administrators have access to web-based dashboard to IK-CMS. Interface between OS and IK-CMS is currently under development.	OS administrative access should be established between OS and IK-CMS by March 25, 2020.  3/25/2020 – Defect resolved.
DFT005	User was not presented with terms of service and privacy policy while trying to connect to IKE Wi-Fi.	Low	Resolved	SMH-WFS002-V01 SMH-WFS003-V01 SMH-WFS006-V01	Defect confirmed and resolved.	Project team is working with the vendor to make sure terms of service will be presented to the user.  4/8/2020 – User is presented with terms of services before connecting to Wi-Fi at all SMH locations. Defect resolved.
DFT006	No usage policy which states that vendor logs user connection timestamp, IP, Media Access Control (MAC) address, OS, device manufacturer, sites visited, and connection status and length.	Low	Closed	SMH-WFS005-V01	Defect confirmed. Wi-Fi connection will not terminate after 15 min of connectivity.	System design CR001 logged. Defect closed.

DEFECT NO.	DEFECT DESCRIPTION	SEVERITY	DEFECT STATUS	TEST ID	RESOLUTION DESCRIPTION	COMMENTS
DFT007	Car-sharing signs and pavement markings not installed at Columbus State Community College.	Low	Resolved	Refer to car-sharing section for Columbus State Community College SMH location in <b>Table 16</b> .	Defect Confirmed and resolved.	Signs and pavement markings will be installed upon completion of the on-going resurfacing project at the SMH location. The installation is expected to be complete by the end of April 2020.  7/28/2020 - Defect resolved.
DFT008	Designated paved area shall be made available for dockless devices such as scooters and ebikes at the SMH facility.	Low	Closed	Refer to dockless device zone section for Columbus State Community College SMH location in <b>Table 16</b> .	Defect Confirmed.	Design change CR002 logged.  6/25/2020 – Defect closed.
DFT009	Park & Ride at COTA Northern Lights Park & Ride SMH location is located on paved surface but does not have a slope of less than 3 percent.	Low	Closed	Refer to park & ride section for COTA Northern Lights Park & Ride SMH location in <b>Table 16</b> .	Defect Confirmed. The COTA Northern Lights Park & Ride is existing amenity. The slope is more than 3% for proper drainage at the location. The project team decided to not make any construction changes due to that reason. Defect closed.	

DEFECT NO.	DEFECT DESCRIPTION	SEVERITY	DEFECT STATUS	TEST ID	RESOLUTION DESCRIPTION	COMMENTS
DFT010	Property Owner shall regulate use of all SMH Wi-Fi technologies.	Low	Closed	Refer to Table 17 SMH-RG2413-V02.	Defect confirmed. Property owners will not regulate use of Wi-Fi technologies. IK vendor will be responsible.	Defect closed. IK vendor regulates use of all SMH Wi-Fi technologies. Project team agrees with the design change request.  System design change request CR004 logged.

Source: City of Columbus

### 3.3. CHANGE REQUEST LOG

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

Table 6: Change Request Log

CR ID	Description	Justification	Defect ID	Requirement	Status
CR001	No usage policy in place which states that vendor logs user connection timestamp, IP, Media Access Control (MAC) address, OS, device manufacturer, sites visited, and connection status and length.	Due to the complexities in customizing the design of off-the-shelf product and existing design policies followed by the vendor.	DFT006	SMH-DR2401-V01 SMH-SR2416-V01	Approved. Project team decided it's acceptable to not log the Wi-Fi connection timestamp and other data due to PII reasons.



CR ID	Description	Justification	Defect ID	Requirement	Status
CR002	Designated paved area shall be made available for dockless devices such as scooters and ebikes at the SMH facility.	City partnered with IKE Smart City and installed docking charging station to test the usefulness of charging station for scooters. Due to the design change, the installed charging station is only compatible for scooters and not for ebikes.	DFT008	SMH-FN2442-V01	Approved. Project team approved the installation of charging station instead of dockless parking zone at this SMH location. Due to which the docking area won't be compatible for ebikes.
CR003	The IK shall allow the user to enter trip feedback such as the operational status of the just docked bike. The operational status could include the need for preventative and repair maintenance.	Feedback regarding each individual mobility provider will be handled by the respective mobility providers. There is no IK feature that prompts for feedback after the use of a mobility option.		SMH-FN2292-V02	Approved. Project team approved change request with not prompting for feedback since feedback option is handled by the mobility providers.
CR004	Property Owner shall regulate use of all SMH Wi-Fi technologies.	IK vendor regulates use of all SMH Wi-Fi technologies.	DTF010	SMH-RG2413-V02	Approved. Project team approved the change request with K vendor being responsible for all SMH Wi-Fi technologies.
CR005	SMH may consider IEEE 802.11ai to enable Fast Initial Link Setup (FILS) methods to enhance End-User experience in high-density Wireless Local Area Network (WLAN) environments.	IK vendor uses a different WLAN setup. Since for this project, off-the-shelf products are used by the IK vendor and due to the complexities involved changing the design polices, existing configuration is used WLAN environments.		SMH-FN2405-V01	Approved. Project team approved the change request with IK vendor using a different setup for the WLAN environments.

Source: City of Columbus

### 3.4. OUTSTANDING ISSUES

This section discusses any open defects the project is tracking along with the reason it remains open. At this time, there are no outstanding issues.

# Chapter 4. Summary of Results

As part of the testing the SMH system, each test case was tested at all SMH locations. Each IK was tested by the vendor pre and post-installation, all mobility infrastructure deployed at the SMH sites was verified to make sure constructability standards were followed during construction, preliminary testing was conducted for all test cases which test the functionality of SMH components like ECB, Wi-Fi services and Pivot App, and acceptance testing scenarios were created to test the functionality of the SMH system as one component.

In addition to the pre and post-installation verification and daily field support verification, a total of 520 tests were conducted across all SMH sites as shown in **Table 7**. Pre-flight testing was conducted in November and December 2019. Post-installation testing was conducted in January and February 2020. Preliminary, acceptance and mobility infrastructure testing took place in February 2020. 94.8% of the test cases were passed and the remaining test cases were either marked as deferred, failed or canceled. All the deferred, failed and cancelled test cases are logged in the defect management log in **Table 5**. All those test cases were closely monitored and necessary steps were taken to have all the test cases resolved and closed by the launch of this project. Any remaining open deferred test cases noted in **Table 5** will be monitored and updated as necessary. **Table 7** shows the summary of the test results. **Table 8** shows the test status and number of tests conducted by IK functionality and other installed components as part of the SMH system.

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.

**Table 7: Test Results Summary**

	Total Planned	Total Passed	Total Failed	Total Deferred	Total Cancelled
Total Number of Tests	520	493	1	10	16
Percentage		94.8%	0.2%	2%	3%

Source: City of Columbus

**Table 8: Test Cases by Test Status**

Test Case Status	Total	Mobility Infrastructure	Agreement Verification Requirements	Preliminary Testing				Acceptance Testing
				CTP	ECB	IK Functionality	Wi-Fi Services	
Planned	520	187	51	39	36	102	48	57
In-Progress	0	0	0	0	0	0	0	0
Passed	493	183	46	33	30	102	42	57
Failed	1	1	0	0	0	0	0	0
Deferred	10	3	1	6	0	0	0	0
Cancelled	16	0	4	0	6	0	6	0

Source: City of Columbus

**Table 9: Defect Matrix Open vs Closed**

Defect Status	Total	High	Medium	Low
Open	0	0	0	0
Closed	5	0	0	5
Canceled	0	0	0	0
Resolved	4	2	0	2
Deferred	1	0	1	0

Source: City of Columbus

**Table 10: Change Request Status**

Change Request Status	Approved	Submitted	Total
	5	0	5

Source: City of Columbus

## 4.2. EXIT CRITERIA

Table 12 summarizes the conditions that were required to considered testing complete.

**Table 11: Test Exit Criteria**




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

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 12: Test Signoffs**

Tester	Role	Name	Date	Signature
System Owner	City of Columbus representative overseeing the completion of all projects and testing.	Andy Wolpert	8/4/2020	
Test Manager	Develops testing report summaries and scheduling	Jeff Kupko	8/4/2020	
Technical Tester	A technically advanced user able to perform advanced system tests, such as validate point-to-point data protection.	Rama Krishna Boyapati	8/4/2020	

Source: City of Columbus

## Appendix A. Interactive Kiosk Manufacturing Pre-Flight Test Results

Each step listed in **Table 13** is executed and signed off on for each SMH kiosk prior to packaging and shipping. These steps were developed by the IK manufacturer. Some steps correspond directly to a project system requirement. If so, the requirement identifier is noted.

Table 13 provides the manufacturing pre-flight test results, signed off on by IKE Smart City, for each kiosk installed at each SMH location.

**Table 13: Interactive Kiosk Manufacturing Pre-Flight Test Results**

Step	Procedure	Req ID	CSCC	COTA Linden Transit Center	Metro Library – Linden Branch	St. Stephen's Community House	COTA Northern Lights Park and Ride	COTA Easton Transit Center
		Inspection Date	11/25/2019	12/4/2019	12/9/2019	12/2/2019	12/2/2019	12/9/2020
3	Review DDI Serial Number. Confirm all fields are complete.	SMH-FN2348-V01	X	X	X	X	X	X
4	Touchscreen: Confirm responses in all areas of the screen.	SMH-FN2347-V01	X	X	X	X	X	X
5	Touchscreen: Confirm calibration is accurate.	SMH-PY2370-V01	X	X	X	X	X	X
		SMH-FN2347-V01	X	X	X	X	X	X
6	Touchscreen: Visually inspect and record and photograph any visual defects in lamination.	SMH-FN2347-V01	X	X	X	X	X	X
7	Visually inspect monitor for any image quality and debris.		X	X	X	X	X	X
8	Visually inspect all letters and inserts. Confirm alignment and clarity.	SMH-PY2370-V01	X	X	X	X	X	X
		SMH-FN2352-V02	X	X	X	X	X	X
9	Visually inspect exterior. Record and photograph any defects (i.e. coat blemishes, dents, scratches, etc...).		X	X	X	X	X	X
10	Test Emergency Call Panel (if installed).		X	X	X	X	X	X
11	Selfie camera: Confirm that outer perimeter of ELP camera has been removed (cut off).		X	X	X	X	X	X
12	Selfie camera: Confirm view is unobstructed, lens is clean, and camera is focused. Object that is 8 ft away from kiosk, and centered in front of screen, should be in center of visual field.		X	X	X	X	X	X
13	Login to Linkett Wi-Fi and confirm network availability.	SMH-IF2409-V01	X	X	X	X	X	X
14	Confirm air gap between monitor & window is consistent @ - °/» inch.		X	X	X	X	X	X
15	Confirm D-foam is installed along vertical window brackets. Foam must be straight and make contact with monitor bezel for entire length.		X	X	X	X	X	X
16	Visually inspect all external LED lights. Confirm function and brightness is consistent.	SMH-PR2452-V01	X	X	X	X	X	X
17	Open and lock both doors. Confirm that a single person can open and shut the door easily and that no gaps are present.	SMH-PY2369-V01	X	X	X	X	X	X

Appendix A. Interactive Kiosk Manufacturing Pre-Flight Test Results

Step	Procedure	Req ID	CSCC	COTA Linden Transit Center	Metro Library – Linden Branch	St. Stephen's Community House	COTA Northern Lights Park and Ride	COTA Easton Transit Center
18	Confirm lock orientation is correct. Notches in key should match the direction of the Custom Cam Latch.	SMH-PY2369-V01	X	X	X	X	X	X
19	Confirm that silicon and gasket is applied to E911 button/Closure Panel interface.	SMH-PY2369-V01	X	X	X	X	X	X
20	Confirm correct size TrimLock (9/32" bulb size) and P-foam are installed along door seals.	SMH-PY2369-V01	X	X	X	X	X	X
21	Visually inspect A/C installation with sample A/C unit. Confirm fitment and clearance for conduit and/or wire raceway.	SMH-PY2370-V01	X	X	X	X	X	X
22	Confirm that kinetic LED connectors are wrapped with electrical tape, or heat shrink.		X	X	X	X	X	X
23	Confirm white LED panels are aligned and installed in correct orientation.		X	X	X	X	X	X
24	Confirm all desired options are installed.		X	X	X	X	X	X
25	Confirm all power and communication lights are on the computer and router.		X	X	X	X	X	X
27	Confirm PCAP board cover is installed and sealed by foam	SMH-PY2372-V01	X	X	X	X	X	X
28	Confirm all cord grips are beyond hand tight (load center grips, may be tightened in the field).	SMH-PY2372-V01	X	X	X	X	X	X
29	Inspect wire management. Note any pinch points or discrepancies.	SMH-PY2372-V01	X	X	X	X	X	X
30	Check all electrical connections for secure connection by performing tug test on all power wires.	SMH-PY2372-V01	X	X	X	X	X	X
31	Confirm that Elec panels cover are aligned and installed correctly.	SMH-PY2372-V01	X	X	X	X	X	X
32	Confirm player 1 and 2 are installed and showing on network.		X	X	X	X	X	X
33	Confirm all appropriate options are installed.		X	X	X	X	X	X
34	If applicable, confirm NVR, security cameras, emergency call button and AQM are visible on network.		X	X	X	X	X	X
35	Confirm that all necessary UL stickers are installed (see UL sticker location instructions).	SMH-PY3066-V01	X	X	X	X	X	X
36	Confirm replacement gasket is installed on antenna and that antenna lock nut is securely fastened.		X	X	X	X	X	X
37	Test the unit operation with sample AC board.		X	X	X	X	X	X
38	Test each door with sample player.		X	X	X	X	X	X
39	Are the network switches operating correctly?		X	X	X	X	X	X

Notes: X = Passed

Source: IKE Smart City



## Appendix B. Interactive Kiosk Post-Installation Test Results

For each kiosk installed at the SMH location, post-installation verification was conducted and signed off by IKE Smart City to make sure the external and internal components installed were working properly. **Table 14** shows the manufacturing post-installation test results for kiosk installed at the each SMH location.

**Table 14: Interactive Kiosk Post-Installation Test Results**

Step	Procedure	CSCC	COTA Linden Transit Center	Metro Library – Linden Branch	St. Stephen's Community House	COTA Northern Lights Park and Ride	COTA Easton Transit Center
	Inspection Date	2/5/2020	1/14/2020	2/2/2020	1/13/2020	1/15/2020	2/1/2020
1	Touchscreen: Visually inspect and record and photograph any visual defects in lamination.	X	X	X	X	X	X
2	Use bubble level to confirm kiosk is level. Must be between the lines	X	X	X	X	X	X
3	Touchscreen: Confirm calibration	X	X	X	X	X	X
4	Touchscreen: Confirm responses in all areas of the screen	X	X	X	X	X	X
5	Inspect all exterior surfaces for significant cracks, dents or scratches. Record and take pictures findings. Confirm unit is clean	X	X	X	X	X	X
6	Run photobooth app and test selfie camera for function and clarity	X	X	X	X	X	X
7	Verify D-form seal between door and monitor	X	X	X	N/A	X	X
8	Confirm A/C unit is running and no excessive noise exists	X	X	X	N/A	X	X
9	Verify that all external LEDs are on ("Ike", "Street Name", and kinetic). Kinetic light default color is blue.	X	X	X	X	X	X
10	Log into NVR (if applicable). Confirm all security cameras display video. Confirm video feed is recording.	X	X	X	X	X	X
11	Log into A/C system. Verify connectivity.	X	X	X	N/A	X	X
12	Verify that all UL stickers and Nameplate are visible (see UL sticker location instructions document).	X	X	X	X	X	X
13	Verify that all cord grips are tightened with a wrench	X	X	X	X	X	X
14	Confirm that are wiring is routed such that pinch points do not exist	X	X	X	X	X	X
15	Linkett: Log into "IKE Free WiFi" and confirm internet access	X	X	X	X	X	X
16	Confirm anchor points are sealed (rubber washer, fender washer and bolt) are installed and tightened	X	X	X	N/A	X	X
17	Confirm one person can close each door without damaging seal	X	X	X	X	X	X
18	Confirm visual quality of monitors	X	X	X	X	X	X
19	Record whether monitor settings are preserved after restart	X	X	X	X	X	X
20	Log into brightness board. Verify connection and appropriate settings.	X	X	X	X	X	X
21	Confirm that monitor brightness is correct: are ads visible in direct sunlight? Not overly bright at night?	X	X	X	X	X	X

Appendix B. Interactive Kiosk Post-Installation Test Results

Step	Procedure	CSCC	COTA Linden Transit Center	Metro Library – Linden Branch	St. Stephen's Community House	COTA Northern Lights Park and Ride	COTA Easton Transit Center
22	Verify that all AC sensors are operational	X	X	X	N/A	X	X
23	Perform emergency test call. Verify proper programming, location info and quality	X	X	X	X	X	X
24	Take pictures of all sides of kiosk	X	X	X	X	X	X

Notes: X = Passed, N/A = for IK located inside a building

Source: IKE Smart City

## Appendix C. Interactive Kiosk Field Support and Maintenance Test Results

**Table 15** shows the IK field inspection and maintenance checklist used to perform daily inspections to make sure the kiosks were working properly at all SMH locations. The inspection and maintenance checklist is used by the manufacturer. Many of the procedures were used to demonstrate a specific project system requirement. The SMH system requirement identifier is included for these procedures.

Field support and maintenance will be conducted at each SMH kiosk on a daily basis by IKE Smart City. **Table 15** shows the test results from initial field support and maintenance that was conducted and signed by IKE Smart City.

**Table 15: Interactive Kiosk Field Support and Maintenance Test Results**

Test Item	Req ID	CSCC	COTA Linden Transit Center	Metro Library – Linden Branch	St. Stephen’s Community House	COTA Northern Lights Park and Ride	COTA Easton Transit Center
Inspection Date		2/17/2020	2/17/2020	2/17/2020	2/18/2020	2/17/2020	2/17/2020
<b>Hardware Daily Test</b>							
Wash glass face. Wash body of kiosk top to bottom.		X	X	X	X	X	X
Remove Graffiti or other marks. If applicable, describe what graffiti was removed and where on kiosk it was located (example: spray paint on side, sticker on front base, etc. ).		X	X	X	X	X	X
Check for scratches or other damage	SMH-ST3072-V01	X	X	X	X	X	X
Pick up and dispose of debris or garbage	SMH-DP2327-V01	X	X	X	X	X	X
Check filter bi-weekly, swap new filters as needed or on monthly basis.		X	X	X	X	X	X
<b>Software/Application Daily Test</b>							
Once a unit is set up and powered on, perform the following checks on both sides of the unit:							
Ad-loop is cycling through ads	SMH-FN2353-V02	X	X	X	X	X	X
When tapped, unit transitions from the ad-loop to the dashboard correctly	SMH-FN2354-V01	X	X	X	X	X	X
Time and weather are displaying correctly based on current location and time zone	SMH-IF2362-V01 SMH-FN2344-V02	X	X	X	X	X	X
City specific application designs are displaying	SMH-FN2344-V02	X	X	X	X	X	X
Unit returns to the ad-loop after 60 seconds of inactivity	SMH-FN3059-V01	X	X	X	X	X	X
<b>Directory Listing Applications (Choose one of Eat and Drink, Shop, Stay, Activities, Parks &amp; Outdoor, Museums &amp; Culture, Social Services, Civic Resources):</b>							
Listings appear correctly – Name, address, category, directions with time, images (if present otherwise category icon)	SMH-IF2362-V01 SMH-FN2344-V02	X	X	X	X	X	X
Can filter results by category		X	X	X	X	X	X
Can search by name / category		X	X	X	X	X	X
Tapping the card flips to the detail view and the map zooms to show directions		X	X	X	X	X	X

Test Item	Req ID	CSCC	COTA Linden Transit Center	Metro Library – Linden Branch	St. Stephen’s Community House	COTA Northern Lights Park and Ride	COTA Easton Transit Center
Detail view has appropriate content	SMH-IF2362-V01 SMH-FN2344-V02	X	X	X	X	X	X
Tapping "Get Directions/info" displays the texting background and allows you to text the listing info to your phone		X	X	X	X	X	X
Can pan the map and pinch to zoom in & out	SMH-FN2448-V01	X	X	X	X	X	X
Click a pin on the map displays the detail card		X	X	X	X	X	X
<b>Arcade</b>							
Game starts and you can play		X	X	X	X	X	X
<b>Get Around Application</b>							
City specific transit map loads properly		X	X	X	X	X	X
Bus stops load properly		X	X	X	X	X	X
When a stop is tapped, screen zooms to focus on that stop, available modes the route information		X	X	X	X	X	X
Tapping "Get Directions/info" displays the texting background and allows you to text the listing info to your phone		X	X	X	X	X	X
Search for a place works		X	X	X	X	X	X
Can pan the map and pinch to zoom in & out		X	X	X	X	X	X
<b>Explore</b>							
City specific transit map loads properly		X	X	X	X	X	X
Search for a place works		X	X	X	X	X	X
Selecting a place shows the detailed view		X	X	X	X	X	X
Tapping "Get Directions/info" displays the texting background and allows you to text the listing info to your phone		X	X	X	X	X	X
Can pan the map and pinch to zoom in & out		X	X	X	X	X	X
<b>Survey says</b>							
Questions load properly		X	X	X	X	X	X
<b>Photobooth</b>							
Interface loads correctly		X	X	X	X	X	X
Frames are available and apply correctly		X	X	X	X	X	X
Filters are available and apply correctly		X	X	X	X	X	X

Test Item	Req ID	CSCC	COTA Linden Transit Center	Metro Library – Linden Branch	St. Stephen’s Community House	COTA Northern Lights Park and Ride	COTA Easton Transit Center
Stickers are available and apply correctly		X	X	X	X	X	X
Photos are taken		X	X	X	X	X	X
Verify photo can be set via text and correct photo is received		X	X	X	X	X	X

Notes: X = Passed

Source: IKE Smart City



## Appendix D. Mobility Infrastructure Test Results

The mobility infrastructure checklist was focused on following constructability standards for new infrastructure deployed as part of this project. Each test case was tested by the project team which includes System Owner (Andy Wolpert, City of Columbus), Test Manager (Jeff Kupko, Michael Baker International), Technical Tester (Matt Graf, HNTB) and Construction Inspector (Sonja Summer, City of Columbus). **Table 16** provides a log of the final inspection results for various transportation amenities deployed at the SMH locations.

**Table 16: Mobility Infrastructure Inspection Test Results**

Test Case	Req. ID	Columbus State Community College		Linden Transit Center		St. Stephen's Community House		Metro Library – Linden Branch		Northern Lights Park and Ride		Easton Transit Center		Comments
		Status	Date	Status	Date	Status	Date	Status	Date	Status	Date	Status	Date	
Field Installation Results														
SMH Sign		Passed	2/12/2020	Passed	12/6/2019	Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	Passed	12/9/2019	
Bike Racks														
Verify that the bike racks are located on paved or pervious surface with a slope no greater than 3 percent.	SMH-PY2278-V01	Passed	2/12/2020	N/A		Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	Passed	12/9/2019	Bike-racks are an existing feature at all SMH locations except COTA Linden Transit Center.
The bike racks shall support a bicycle in a stable upright position.	SMH-FN3071-V01	Passed	2/12/2020	N/A		Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	Passed	12/9/2019	
Verify that the bike racks have a vertical clearance of at least 6 feet.	SMH-PY2279-V01	Passed	2/12/2020	N/A		Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	Passed	12/9/2019	
Verify that the bike racks have an access aisle with a minimum width of 5 feet.	SMH-PY2280-V01	Passed	2/12/2020	N/A		Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	Passed	12/9/2019	
Verify that minimum number of bike racks per SMH location should be equal to 5 percent of the total number of parking spaces.	SMH-AR2274-V02	Passed	2/12/2020	N/A		Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	Passed	12/9/2019	
Verify that the bike racks are modular in construction so that additional racks may be installed in the future with similar overall functional and aesthetic qualities.	SMH-LC2456-V01	Passed	2/12/2020	N/A		Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2016	Passed	12/9/2019	
The City or Property Owner shall approve the locations of the bike racks. (Per final construction plans)	SMH-RG2276-V01	Passed	2/12/2020	N/A		Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2016	Passed	12/9/2019	

Test Case	Req. ID	Columbus State Community College		Linden Transit Center		St. Stephen's Community House		Metro Library – Linden Branch		Northern Lights Park and Ride		Easton Transit Center		Comments
The placement of bike racks shall not impede flow of vehicle or pedestrian traffic.	SMH-PR2275-V01	Passed	2/12/2020	N/A		Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2016	Passed	12/9/2019	
<b>Bike-Sharing</b>														
Verify that the bike-share docking station is located at a SMH location.	SMH-FN2290-V02	Passed	2/12/2020	Passed	2/7/2020	Passed	2/12/2020	Passed	2/7/2020	N/A		Passed	2/7/2020	
The SMH shall provide an interface to the bike-share company.	SMH-DR2283-V02	Passed	2/12/2020	Passed	2/7/2020	Passed	2/12/2020	Passed	2/7/2020	N/A		Passed	2/7/2020	
Verify that the docking station is solar powered.	SMH-FN2293-V01	Passed	2/12/2020	Passed	2/7/2020	Passed	2/12/2020	Passed	2/7/2020	N/A		Passed	2/7/2020	Metro Library also supplemented with hard-wired power due to being on the north side of the building.
Verify that the bike-share docking station is located on paved or pervious surface with a slope no greater than 3 percent	SMH-PY2305-V01	Passed	2/12/2020	Passed	2/7/2020	Passed	2/12/2020	Passed	2/7/2020	N/A		Passed	2/7/2020	
Verify that the bike-share docking station has a vertical clearance of at least 6 feet.	SMH-PY2306-V01	Passed	2/12/2020	Passed	2/7/2020	Passed	2/12/2020	Passed	2/7/2020	N/A		Passed	2/7/2020	
Verify that the bike-share docking station has an access aisle with a minimum width of 5 feet.	SMH-PY2307-V01	Passed	2/12/2020	Passed	2/7/2020	Passed	2/12/2020	Passed	2/7/2020	N/A		Passed	2/7/2020	
The docking station shall permit the locking of the bicycle frame and one wheel to the rack.	SMH-SR2308-V01	Passed	2/12/2020	Passed	2/7/2020	Passed	2/12/2020	Passed	2/7/2020	N/A		Passed	2/7/2020	
The docking station shall support a bicycle in a stable upright position.	SMH-FN3070-V01	Passed	2/12/2020	Passed	2/7/2020	Passed	2/12/2020	Passed	2/7/2020	N/A		Passed	2/7/2020	
Docking station should be modular in construction so that additional racks may be installed in the future with similar overall functional and aesthetic qualities.	SMH-LC2457-V01	Passed	2/12/2020	Passed	2/7/2020	Passed	2/12/2020	Passed	2/7/2020	N/A		Passed	2/7/2020	



Test Case	Req. ID	Columbus State Community College		Linden Transit Center		St. Stephen's Community House		Metro Library – Linden Branch		Northern Lights Park and Ride		Easton Transit Center		Comments
Verify that the docking station is primarily located within the public right-of-way, along public streets and sidewalk, parks, trails, parking lots/garages, events venues, etc., or is located on private property, provided that the property owner agrees to allow 24/7 public access to the docking station.	SMH-RG2303-V01	Passed	2/12/2020	Passed	2/7/2020	Passed	2/12/2020	Passed	2/7/2020	N/A		Passed	2/7/2020	
Verify that the City and property owner approve the locations of the docking station.	SMH-RG2461-V02	Passed	2/12/2020	Passed	2/7/2020	Passed	2/12/2020	Passed	2/7/2020	N/A		Passed	2/7/2020	
The bike-share docking station shall not impede flow of vehicle or pedestrian traffic	SMH-PR2301-V02	Passed	2/12/2020	Passed	2/7/2020	Passed	2/12/2020	Passed	2/7/2020	N/A		Passed	2/7/2020	
<b>Car-Sharing</b>														
Verify that the SMH facility provides designated parking spaces for car-share vehicles.	SMH-FN2310-V02	Passed	2/12/2020 Defect DFT007 logged. 7/28/2020 Defect DFT007 resolved.	N/A		Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	N/A		Car-share space installation at Columbus State deferred until the Creative Campus roadway final wearing course installation is complete.
Verify that the car-share parking lots have a vertical clearance of at least 12 feet.	SMH-PY2312-V01	Passed	2/12/2020 Defect DFT007 logged. 7/28/2020 Defect DFT007 resolved.	N/A		Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	N/A		Car-share space installation at Columbus State deferred until the Creative Campus roadway final wearing course installation is complete.
Verify that the car-share parking lots are located on paved or pervious surfaces with a slope of less than 3 percent.	SMH-PY2313-V01	Passed	2/12/2020 Defect DFT007 logged. 7/28/2020 Defect DFT007 resolved.	N/A		Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	N/A		Car-share space installation at Columbus State deferred until the Creative Campus roadway final wearing course installation is complete.

Test Case	Req. ID	Columbus State Community College	Linden Transit Center	St. Stephen's Community House	Metro Library – Linden Branch	Northern Lights Park and Ride	Easton Transit Center	Comments					
Verify that additional parking spaces can be investigated if warranted by increased demand for car-sharing services.	SMH-LC2458-V02	Passed	2/12/2020 Defect DFT007 logged. 7/28/2020 Defect DFT007 resolved.	N/A	Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	N/A	Car-share space installation at Columbus State deferred until the Creative Campus roadway final wearing course installation is complete.	
<b>Dockless Device Zone</b>													
Verify that additional space for dockless equipment zone can be made available by stakeholder agency if warranted by increased demand for this service.	SMH-LC2445-V02	Deferred	7/25/2020 Defect DFT008 logged. Design change request CR002 logged. Defect DFT008 closed.	Passed	12/6/2019	Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	N/A	
Verify that the City and property owner approve of the location of the dockless device zone.	SMH-RG2447-V01	Passed	7/25/2020	Passed	12/6/2019	Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	N/A	
The dockless parking zone shall not be laid out in a manner which impedes the flow of vehicle or pedestrian traffic.	SMH-PR2450-V02	Passed	7/25/2020	Passed	12/6/2019	Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	N/A	
Designated paved area shall be made available for dockless devices such as scooters and ebikes at the SMH facility.	SMH-FN2442-V01	Deferred	7/25/2020 Defect DFT008 logged. Design change request CR002 logged. Defect DFT008 closed.	Passed	12/6/2019	Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	N/A	
Boundaries, symbols and/or text description of designated area for dockless devices shall be clearly outlined on pavement with paint.	SMH-FN2443-V01	Deferred	7/25/2020 Defect DFT008 logged. Design change request CR002 logged. Defect DFT008 closed.	Passed	12/6/2019	Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	N/A	
<b>Park &amp; Ride</b>													
Verify that the park & ride facility has a vertical clearance of at least 12 feet.	SMH-PY2386-V01	N/A		N/A		N/A		N/A		Passed	12/9/2019	Passed	12/9/2019

Test Case	Req. ID	Columbus State Community College		Linden Transit Center		St. Stephen's Community House		Metro Library – Linden Branch		Northern Lights Park and Ride		Easton Transit Center		Comments
Verify that the park & ride facility has an access aisle with a minimum width of 5 feet.	SMH-PY2387-V01	N/A		N/A		N/A		N/A		Passed	12/9/2019	Passed	12/9/2019	
Verify that the park & ride facility parking lot is located on paved or pervious surfaces with a slope of less than 3 percent.	SMH-PY2454-V01	N/A		N/A		N/A		N/A		Failed	12/9/2019 Park & Ride is an existing amenity and no construction changes were made to existing amenities. Defect logged DFT009. Defect closed.	Passed	12/9/2019	
Verify that at least one ADA-compliant parking space is available at each of the SMH locations for every 25 spaces. One out of six of the ADA-compliant spaces must be van accessible. An accessible car parking space must be a minimum of 96 inches wide, and a van space must be a minimum of 132 inches wide (a van space may be 96 inches if the access aisle is 96 inches or wider).	SMH-AR2381-V02	N/A		N/A		N/A		N/A		Passed	12/9/2019	Passed	12/9/2019	
The park and ride parking spaces shall allow 24/7 public access to the vehicles.	SMH-PR2382-V02	N/A		N/A		N/A		N/A		Passed	12/9/2019	Passed	12/9/2019	
The park-and-ride facility shall allow parked vehicles to maintain unimpeded access to roadway/driveway entrances and exits.	SMH-PR2383-V01	N/A		N/A		N/A		N/A		Passed	12/9/2019	Passed	12/9/2019	
The park and ride designated parking spaces shall be located in locations that do not impede the regular flow of travel in the public right of way.	SMH-PR2384-V02	N/A		N/A		N/A		N/A		Passed	12/9/2019	Passed	12/9/2019	

Test Case	Req. ID	Columbus State Community College		Linden Transit Center		St. Stephen's Community House		Metro Library – Linden Branch		Northern Lights Park and Ride		Easton Transit Center		Comments
The park-and-ride facility shall ensure the vehicles not be parked in a way that impedes the 5 feet clearance on sidewalks needed for ADA compliance.	SMH-PR2385-V01	N/A		N/A		N/A		N/A		Passed	12/9/2019	Passed	12/9/2019	
Additional parking spaces should be made available if warranted by increased demand for park-and-ride services.	SMH-LC2455-V01	N/A		N/A		N/A		N/A		Passed	12/9/2019	Passed	12/9/2019	
The IK touch screen shall provide users with a link to the COTA Real-Time Display.	SMH-IF2360-V01	N/A		N/A		N/A		N/A		Passed	12/9/2019	Passed	12/9/2019	
<b>Ride-Hailing</b>														
Verify that additional space for pick-up/drop-off zone can be made available if warranted by increased demand for ride-hailing services.	SMH-LC2459-V02	N/A		Passed	12/6/2019	Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	Passed	12/9/2019	
Verify that the ride-hailing location is approved by the City and property owner.	SMH-RG2393-V01	N/A		Passed	12/6/2019	Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	Passed	12/9/2019	
Curb space shall be designated for pickup from ride-hailing and taxi services.	SMH-FN2388-V02	N/A		Passed	12/6/2019	Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	Passed	12/9/2019	
The City and Property Owner may designate parking areas or restrict car parking within certain areas.	SMH-PR2392-V02	N/A		Passed	12/6/2019	Passed	12/6/2019	Passed	12/6/2019	Passed	12/9/2019	Passed	12/9/2019	

N/A: Not available at SMH location.

Source: City of Columbus

Inspection Completed By:

Name: Jeff Kupko

Signature: 

Date: 8/4/2020

Name: Sonja Summer

Signature: 

Date: 8/4/2020

Name: Sherry Kish

Signature: 

Date: 8/4/2020

## Appendix E. Agreement Verification Results

The SMH system requirements listed in **Table 17** were verified by the test manager (Jeff Kupko from Michael Baker International) by reviewing the agreements existing in the SMH project.

**Table 17: Agreement Verification Review**

Req. ID	Description	Pass/Fail	Comments
<b>IKE</b>			
SMH-PR3062-V01	The IK touch-screen interface display shall be at least 55" diagonal.	Passed	
SMH-IF2355-V02	The IK shall provide a secured, direct-connect interface to facilities for operational administration.	Passed	Resides on secure http.
SMH-PY3067-V01	The IK unit shall be capable of withstanding wind loads of $v_{asd} = 80$ mph and $v_{ult} = 105$ mph for up to three seconds.	Passed	
SMH-PY3065-V01	The IK touch-screen interface shall be physically robust to withstand intentional or unintentional impacts normally expected for a commercial grade display accessible to the public.	Passed	
SMH-MT2367-V01	The IK system shall be designed such that administrative and maintenance activities that require the system to be taken off line can occur at periods of lowest public utilization (e.g. overnight) to maintain maximum system availability for public Users.	Passed	
SMH-FN2337-V02	The IK system software shall be capable of the automatic resolution of system abnormalities, security incidents, faults, and errors (to the extent possible).	Passed	Part of the daily checklist to make sure all the apps are working and also any system errors will also show the apps that are not working.
SMH-FN2350-V01	The IK touch-screen interface shall utilize a commercial off-the-shelf Kiosk Operating System (KOS) that resides on top of the OS (latest version of Windows, Linux, or Raspberry Pi), in accordance with the software requirements outlined in this SyRS.	Passed	Main computer is Ubuntu 18 and Raspberry Pi controls comes components.

Req. ID	Description	Pass/Fail	Comments
SMH-MT2368-V01	The vendor shall maintain the IK and back-office IK system.	Passed	
SMH-FN2342-V01	The IK system shall be designed for unattended operation under normal circumstances, exclusive of manual data entry, public User access, and routine administrative functions.	Passed	
SMH-FN2449-V01	Verify the IK system files are “revolving” or self-appending so that old data is continually overwritten, and system data does not reach capacity of available memory.	Passed	Log files are set to ship off and rotate to minimize disk file (14-day retention in cloud).
SMH-SR2379-V01	The IK system shall detect and automatically alert the IK system administrator when it detects a security incident such as the following: <ol style="list-style-type: none"> <li>1. IK access door has been opened.</li> <li>2. Cybersecurity alert has been logged by the unified threat management software (anti-virus, malware detection, etc.).</li> <li>3. Misuse of IK features such as recreational web browsing or attempts to intercept communications between interfaces.</li> </ol>	Passed	No remote door monitoring access but 2 keys are needed to open doors. Visual inspection occurs daily (5 times per week).  OSSEC runs on the computer to detect threats and alerts to Slack. Computers sit behind firewall.
SMH-AR2326-V02	The IK system shall incorporate system redundancies to the extent practical to guard against failure of individual hardware, software, network, or communications components and ensure maximum, persistent always-on availability, maintaining continuous operation outside of the scheduled maintenance 24 hours a day, seven days a week, 365 days a year.	Passed	Two computers per kiosk. Fiber (if applicable) and cellular connectivity. Stock of parts kept locally for repair within a day.
SMH-SR2453-V02	All IK software and security systems shall be reviewed quarterly by IK administrator for updates or as updated as new versions become available.	Passed	Source code reviews GitHub for updates. Operating System updates weekly.
SMH-SR2380-V01	Verify the integrity of IK system apps, communications, and network links are secured through mechanisms such as password authentication.	Passed	
SMH-FN2339-V02	Verify IK system errors, warnings, and self-correcting actions are sent to the IK-CMS at regularly scheduled intervals to ensure there are no gaps in log file data.	Passed	Errors are sent to Error Monitoring System (Century).

Req. ID	Description	Pass/Fail	Comments
SMH-IM2365-V01	The IK system backup files (server clone snapshot and data backups) shall be tested quarterly for recoverability integrity.	Passed	Nightly backups.
SMH-IM3069-V01	All IK software and security systems shall be reviewed quarterly for updates or as updated as new versions become available.	Passed	
SMH-IM2364-V01	The IK system shall perform daily background verification of all external web links and provide immediate notification to the IK system administrator if any link fails verification.	Passed	
SMH-IM2366-V01	The IK system shall capture and log all data entered through the touch-screen interface for further analysis at the back office for purposes of enhancing location aware services and improving safety at each designated location.	Passed	
SMH-SR2376-V01	Verify the IK system components are protected by firewalls and equipped with security detection, prevention, and response mechanisms to guard against intentional and unintentional threats to the integrity of the system arising from unauthorized access, computer viruses and worms, system abnormalities or faults, and other sources of potential harm.	Passed	
SMH-SR2377-V01	Verify the IK system accommodates multiple tiers of user data security to allow distinct privileges to access data based on user roles (e.g. public user, IK administrative user and partner account administrator).	Passed	
SMH-SR2378-V01	Verify the IK system is designed to preserve the privacy of individual public users of the system and provide data protection, such as encrypting login credentials, payment information, and other sensitive data captured through the IK and transmitted over Wi-Fi or fiber.	Passed	
SMH-FN3061-V01	The IK shall include an integrated security camera and DVR.	Passed	

Req. ID	Description	Pass/Fail	Comments
SMH-FN2338-V01	All IK communications links shall utilize Transmission Control Protocol/Internet Protocol (TCP/IP) and possess high-speed bandwidth and availability to perform the functionalities described within this SyRS.	Passed	
SMH-FN2340-V02	The IK system shall reboot following a power loss.	Passed	
SMH-FN2405-V01	SMH may consider IEEE 802.11ai to enable Fast Initial Link Setup (FILS) methods to enhance End-User experience in high-density Wireless Local Area Network (WLAN) environments.	Cancelled	System design change request CR005 logged. Change request approved.
SMH-EN2332-V02	The IK system shall be designed with an open architecture intended to facilitate expansion of the functionality and/or scale of the IK system as new data sources, apps, features, standards and/or technologies emerge in the future.	Passed	
SMH-EN2333-V01	The IK touch-screen interface design elements and page renderings shall be flexible to enable future enhancements as information and data quantity and quality improves/evolves over time, including modular graphics, design templates controlling color schemes, fonts, backgrounds, etc., and implementation of web-development best practices, version control, notation and documentation.	Passed	
SMH-LC2460-V02	The IK touch-screen interface shall be designed with flexibility to allow future expansion such as the addition of new software tools, data sources, or other needs that may emerge in the future.	Passed	
SMH-RG2373-V01	Installation of IK in the City shall comply with building and construction city codes of Columbus, OH.	Passed	
SMH-RG2374-V02	The IK system shall adhere to object-oriented design principles to facilitate replacement or modification of individual components of the IK system without impacting the overall system.	Passed	

**ECB System**



Req. ID	Description	Pass/Fail	Comments
SMH-AR2318-V01	Verify that the ECB service is available 24 hours a day, seven days a week, 365 days a year.	Passed	
SMH-EN2317-V01	Verify that the ECB service undergoes end-to-end testing by vendor on an annual basis.	Passed	
<b>IK Wi-Fi</b>			
SMH-DR2401-V01	Verify that the SMH Wi-Fi technologies log user connection timestamp, IP, Media Access Control (MAC) address, OS, device manufacturer, sites visited, and connection status and length.	Cancelled	Does not store MAC and IP address for PII purposes.  Defect Logged DFT006.  Design change request logged CR001.  Defect DFT006 closed. Design change request approved.
SMH-FN2406-V01	Wi-Fi technologies shall follow IEEE 802.11 b/g/n standards to enable multi-gigabit throughput in the 2.4 GHz, 5GHz and 60GHz spectrum bands.	Passed	
SMH-DR2400-V01	Verify that the SMH Wi-Fi enabled technologies track number of clients per access point.	Passed	
SMH-AR2399-V01	Verify that Wi-Fi network is fault tolerant and maintain continuous network uptime outside of the scheduled maintenance, 24 hours per day, 365 days per year.	Passed	
SMH-MT2410-V01	Verify that IK based Wi-Fi equipment shall be managed and maintained by IK vendor.	Passed	
SMH-RG2413-V02	Property Owner shall regulate use of all SMH Wi-Fi technologies.	Deferred	IK vendor regulates the use of all SMH Wi-Fi technologies.  Defect DFT010 logged. Defect closed.  Design change request CR004 logged. Change request approved.

Req. ID	Description	Pass/Fail	Comments
SMH-MT3068-V01	Verify that stakeholder agency-owned Wi-Fi devices are managed and maintained by the agency.	Passed	COTA, St. Stephen's Community House and Metro Library.
SMH-PY2412-V01	Verify that Wi-Fi equipment withstands indoor and outdoor environmental conditions such as high and low temperatures, humidity, rain, snow, etc.	Passed	
SMH-SR2419-V02	Verify that usage shall be tracked on all Wi-Fi technologies, per device, to validate proper usage of public wireless.	Passed	
SMH-SR2416-V01	Verify that a timer is implemented to track the length of time a Wi-Fi connection has been active.	Cancelled	No Wi-Fi usage policy for tracking the length of time a Wi-Fi connection has been active.  Defect Logged DFT006. Defect closed.  Design change request logged CR001. Change request approved.
SMH-PR3063-V01	The upload and download speed on each Wi-Fi access point shall be tracked, monitored, and changed, as necessary.	Passed	
SMH-PR3064-V01	The load on each Wi-Fi access point shall be monitored and flagged when there is an overloading issue associated with the access point.	Passed	
<b>Mobility Infrastructure</b>			
SMH-DR2284-V01	The bike-share company shall maintain and share monthly with the City a list of deployed bikes at the SMH, listed by unique identifiers.	Passed	
SMH-DR2285-V01	The bike-share company shall maintain and share monthly with the City a list of lost, stolen and vandalized bikes.	Passed	
SMH-DR2286-V01	The bike-share company shall maintain and share monthly with the City a record of maintenance activities including but not limited to identification number and maintenance performed.	Passed	

Req. ID	Description	Pass/Fail	Comments
SMH-AR2282-V01	The docking station shall be designed for persistent always-on availability, maintaining continuous operation 24 hours a day, seven days a week, 365 days a year.	Passed	
SMH-PR2302-V02	Bikes that are parked in violation of City codes or are vandalized or inoperable shall be reported by SMH locations to the bike-share company.	Passed	
SMH-FN2292-V02	The IK shall allow the user to enter trip feedback such as the operational status of the just docked bike. The operational status could include the need for preventative and repair maintenance.	Cancelled	<p>Feedback regarding each individual mobility provider will be handled by the respective mobility providers. There is no IK feature that prompts for feedback after the use of a mobility option</p> <p>Design change request CR003 logged. Change request approved.</p>

Source: City of Columbus

**Verification Completed By:**

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

Signature: 

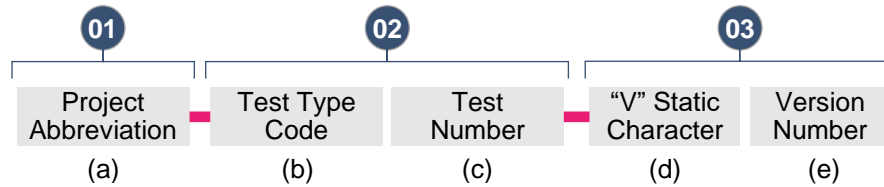
Date: 8/4/2020



# Appendix F. Terminology and Conventions

## F.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 2** and definitions are listed in **Table 18**.



**Figure 2: Numbering Convention**

Source: City of Columbus

**Table 18: Numbering Convention Definitions**

Octet	Description	Data Type, Casing	Number of Characters or Digits
Project Abbreviation	The designated Smart Columbus project acronym (i.e., SMH)	String, upper case	Variable
Test Type Code	IKE: Interactive Kiosk Environment ECB: Emergency Call Button CTP: Comprehensive Trip Planning WFS: Wi-Fi Service	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 integration of Emergency Call Button on the interactive kiosk would be SMH-ECB001-V01.

1. "SMH" is the project abbreviation.
2. "ECB001" 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 G. Acronyms and Definitions

**Table 19:** Acronym List contains project specific acronyms used throughout this document.

**Table 19: Acronym List**

Abbreviation/Acronym	Definition
ADA	Americans with Disabilities Act
AV	automated vehicle
BRT	bus rapid transit
CMS	Central Management System
ConOps	Concept of Operations
COTA	Central Ohio Transit Authority
CR	change request
CTP	comprehensive trip planning
ECB	emergency call button
ECC	emergency call center
FILS	Fast Initial Link Setup
FMLM	first mile/last mile
GPS	global positioning system
GTFS	General Transit Feed specification
IEEE	Institute of Electrical and Electronics Engineers
IK	interactive kiosk
IKE	interactive kiosk environment
IP	Internet protocol
KOS	Kiosk Operating System
MaaS	Mobility as a Service
MAC	Media Access Control
MMPA	Multimodal Trip Planning Application
OS	Smart Columbus Operating System
PDF	portable document format
SMH	Smart Mobility Hub
SyRS	System Requirements
WLAN	Wireless Local Area Network

Source: City of Columbus

## Appendix H. Glossary

**Table 20:** Glossary contains project-specific terms used throughout this document.

**Table 20: Glossary**

Term	Definition
Commercial Off-the-Shelf System (COTS)	Software or hardware products that are ready-made and available for sale to the public. Also referred to as a turnkey system.
Data Retention	The continued storage of data for compliance or business reasons.
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.
MaaS	Mobility as a Service refers to the shift in society from the use of mass-produced personal vehicles, which decentralizes human activities to a human-centric approach. Through the sharing of information, multiple modes of transportation are integrated and offered through a digital platform that provides FMLM mobility bookings, centralized payment, and ticketing across all modes, private and public.
Real-Time Data	Information that is delivered immediately after collection.
Test Number	An integer incrementing by one, indicating the number of tests established.
Transportation Network Companies (TNCs)	Private businesses, nonprofits, and quasi-governmental agencies that offer one or more types of transportation for use in exchange for payment.
Travelers	Travelers are users of the SMH who access amenities and utilize the features at SMH facilities to plan, begin, pass through, or complete their trips.
Testing Version Number	An integer in a set of integers that increment by one, indicating the number of revisions made to a test case or scenario.
“V” Static Character	Static letter “V” represents the testing version.

Source: City of Columbus



THE CITY OF  
**COLUMBUS**  
ANDREW J. GINTHER, MAYOR