



CITS Technical Specifications

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Virginkar & Associates, Inc.
an HJI Group Company

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1 GENERAL

The City of Fort Wayne and Citilink (Agency) and their consultant, EIGER TechSystems (EIGER), have created this scope of work for the procurement of a Citilink Intelligent Transportation System (CITS).

1.1 INTRODUCTION

Citilink is procuring CITS to improve the public transportation services it provides to the community it serves. CITS shall be designed to provide an efficient, effective, reliable, flexible, and expandable bus fleet management system and traveler information system to meet the needs of the Citilink dispatchers, bus drivers, supervisors, management, and Citilink's public ridership. The objectives of CITS are as follows:

- Provide a reliable tool to manage bus operations
- Improve service quality
- Improve delivery of transit information to the public
- Improve operational efficiency

1.2 SCOPE OF WORK

The Contractor shall design, furnish, install, test, and make operational a Citilink Intelligent Transportation System (CITS) for Citilink. The Contractor shall provide supporting documentation, training, and technical support, as specified in this RFP, specifications, and other contract documents. The Contractor shall be responsible for all acts (including working with Citilink staff and its Contractors), tasks, equipment, system components, and services required to provide Citilink with a turnkey CITS that is fully functional in accordance with the Contract and Specifications (collectively referred to as "Work"). The Contractor shall perform all Work whether or not such Work is specifically identified within the Contract and the Specifications unless otherwise expressly agreed to in writing. The primary functional areas of the CITS are as follows:

1. Computer Aided Dispatch with MDTs
2. Automatic Vehicle Location
3. Automatic Voice Annunciation
4. Cellular Data Communication Interface
5. Hosted Computer Subsystem
6. Wireless Local Area Network interface
7. Electronic Signs at Central Station
8. Traveler Information Subsystem includes webpage, app (option), and SMS response (option).
9. API for third-party traveler information systems

10. Mobile dispatching app

1.3 SOLICITATION AND PROJECT SCHEDULE

Event	Date and Time
Request for Proposal Released	Monday, July 1, 2024
Questions and Requests for Clarifications Due via email: pks@fwcitilink.com	Monday, July 15, 2024
CITILINK responds to Questions and Requests for Clarifications	Monday, July 22, 2024
Proposal Due Date	Friday, August 9, 2024 at 10:00 a.m.
Initial Evaluation Period Complete	Friday, August 23, 2024
Vendor Interviews/Demonstrations	Week of August 26, 2024
Anticipated Contract Award	Friday, September 20, 2024

The CITS project duration from Notice to Proceed to System Acceptance shall not exceed twelve months.

1.4 PROPOSAL EVALUATION CRITERIA

EVALUATION CRITERIA	POSSIBLE POINTS
Firm and Team Qualifications and Experience	10
Project Organization and Staffing Plan	10
Implementation and Project Management Plan	10
Proposed System, Services, and Technical Approach	35
Price Proposal/Cost	25
Product Demonstration and Interview (if necessary)	10
TOTAL POINTS POSSIBLE	100

2 CITILINK OVERVIEW

The Contractor is responsible for obtaining all information regarding Citilink's existing systems required to perform its obligations under the Contract. The following information is provided for informational purposes only and does not relieve Contractor of its information-gathering and investigatory obligations.

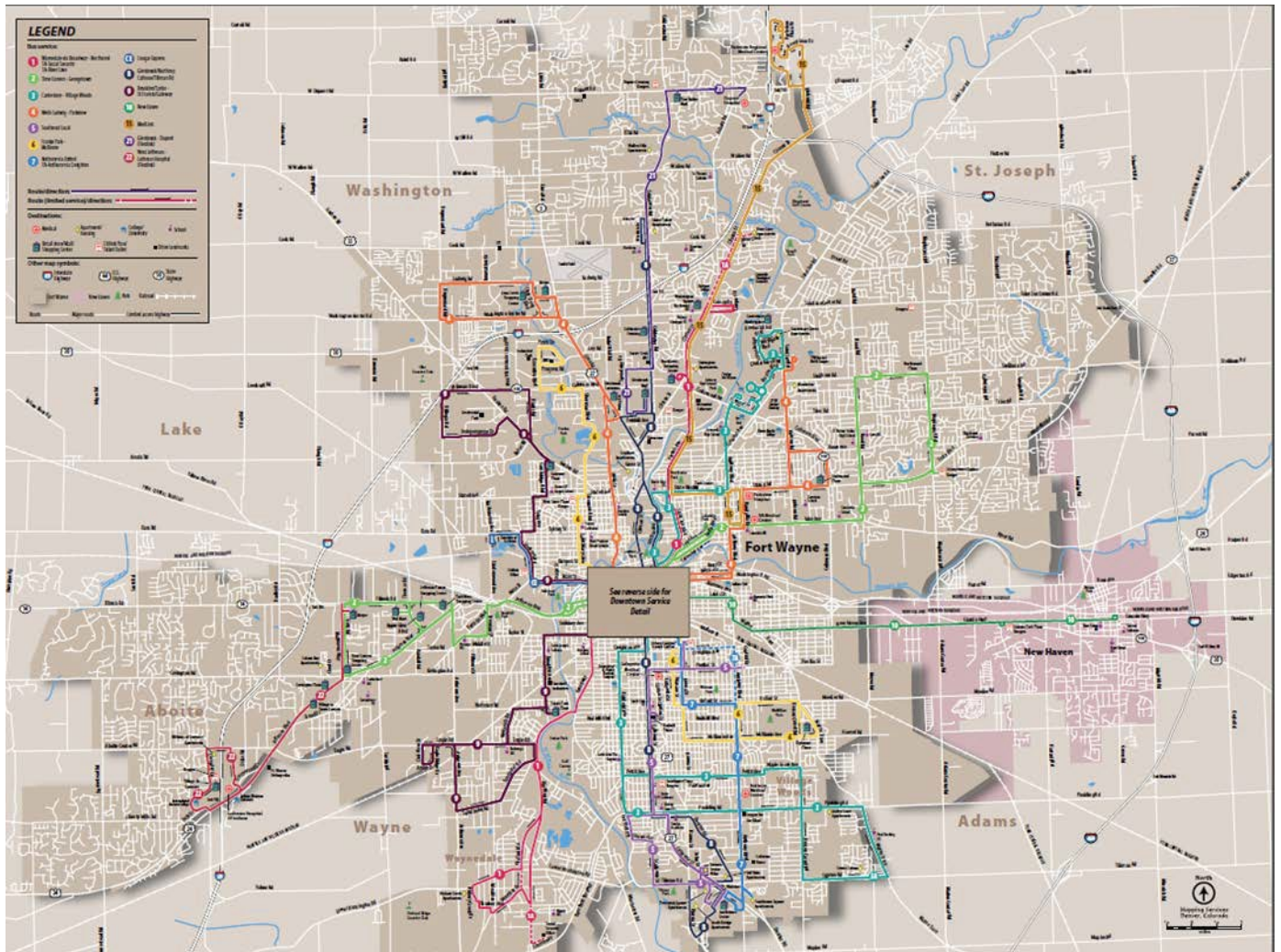
2.1 CITILINK OVERVIEW

Citilink provides approximately 1.6 million passengers rides annually. Citilink operates 13 fixed routes in Allen County specifically within Fort Wayne city limits and portions of New Haven. Citilink's service area is bounded by Georgetown Square (east), Lutheran Hospital (west), Parkview Medical Center (north), and Southtown Centre (south). Citilink services one major transit center, Citilink Central Station. Central Station connects passengers to many different Citilink routes. Citilink operates twenty-five peak fixed route buses during the weekdays, eighteen on Saturday, and no service on Sundays. Citilink also provides additional services including paratransit service called Citilink Access for passengers that cannot access the fixed routes, Citilink Vanpool partnered with a third party to help with commutes, and Citilink Flexlink which allows for alternate stops on two fixed routes.

Citilink desires to improve its transit bus fleet services by implementing CITS. Citilink will use CITS to manage its bus operations from its dispatch area located at the 801 Leesburg Road facility. The dispatcher at the CITS workstation oversees all bus lines, handling exception conditions from the time buses leave the bus yard with scheduled Drivers at scheduled times, until the buses return to the yard. The dispatcher handles voice calls from the buses and other events from a CITS-maintained queue, making radio or other calls to gather information and distribute instructions. The dispatcher changes routes, schedules, and other assignments as necessary to maintain bus service.

CITILINK SERVICE MAP

Citilink's service map can be accessed via the following link: <https://fwcitilink.com/all-routes/>



2.2 BUS FLEET INFORMATION

Citilink's current bus fleet includes ten 40-foot vehicles, twenty-seven 35-foot vehicles, and eight 26-foot vehicles for a total of forty-five vehicles. Twenty-one are hybrid vehicles; thirty-nine use diesel fuel and the remaining six use gasoline. Each vehicle is equipped with a Safety Vision HVR 4112 Recorder (2TB Storage) Vehicle Camera System and a Cradlepoint IBR900 Modem/Router. In addition, all vehicles except for the 2006, 2008, 2010, and 2023 Elkhart Coach models, have a UTA APC system. All the vehicles have a Backlit Stop Request sign onboard. Furthermore, all the Gillig models have an I/O Controls, G'X' electrical system (five G2 2006-2008, nineteen G3 2010-2017, thirteen G4 2018-2024), while the Elkhart Coach models have a Ford OEM (OBDII) electrical system and the Champion model have a Chevy OEM (OBDII) electrical system.

Qty	Model	Engine/ Trans Control	Head Sign	Radio System	PA System	CAD/ AVL/ AVA	Onboard Sign
2	2006, 35' Gillig – Diesel - Low Floor	Cummins 6.7L ISL / Voith D864.3E	Luminator Horizon Amber 16x160	Kenwood NX-800H	SpeakEasy 2	Doublemap System	Adaptive Micro Sys TDR80x7-.3A
3	2008, 35' Gillig – Diesel - Low Floor	Cummins 6.7L ISL / Voith D864.5	Luminator Horizon Amber 16x160	Kenwood NX-800H	SpeakEasy 2	Doublemap System	Adaptive Micro Sys TDR80x7-.3A
7	2010, 35' Gillig – Diesel – Hybrid	Cummins 6.7L ISB-07 / Allison EV-40	Luminator Horizon Amber 16x160	Kenwood NX-800H	SpeakEasy 2	Doublemap System	Adaptive Micro Sys TDR80x7-.3A
1	2012, 35' Gillig – Diesel – Hybrid	Cummins 6.7L ISB 2010 / Allison EP40	Luminator Horizon Amber 16x160	Kenwood NX-800H	SpeakEasy 2	Doublemap System	Adaptive Micro Sys TDR80x7-.3A
5	2013, 35' Gillig – Diesel – Hybrid	Cummins 6.7L ISB 2010 / Allison EV40	Luminator Horizon Amber 16x160	Kenwood NX-800H	SpeakEasy 2	Doublemap System	Adaptive Micro Sys TDR80x7-.3A
4	2015, 40' Gillig – Diesel – Hybrid	Cummins 6.7L ISB 2015 / Allison EV40	Luminator Horizon Amber 16x160	Kenwood NX-800H	SpeakEasy 2	Doublemap System	Adaptive Micro Sys TDR80x7-.3A
1	2016, 40' Gillig – Diesel – Hybrid	Cummins 6.7L ISLB 2015 / Allison EV40	Luminator Horizon Amber 16x160	Kenwood NX-800H	SpeakEasy 2	Doublemap System	Adaptive Micro Sys TDR80x7-.3A
1	2017, 40' Gillig – Diesel – Hybrid	Cummins 6.7L ISB 2016 / Allison EP40	Luminator Horizon Amber 16x160	Kenwood NX-800H	SpeakEasy 2	Doublemap System	Adaptive Micro Sys TDR80x7-.3A
2	2018, 40' Gillig – Diesel – Hybrid	Cummins 6.7L (B6.7) / Allison EP40	Luminator Horizon Amber 16x160	Kenwood NX-800H	SpeakEasy 2	Doublemap System	Adaptive Micro Sys TDR80x7-.3A
2	2019, 40' Gillig – Diesel - Low Floor	Cummins 6.7L L9 2019 / Allison B400R-6	Luminator Horizon Amber 16x160	Kenwood NX-800H	SpeakEasy 2	Doublemap System	Adaptive Micro Sys TDR80x7-.3A
5	2022, 35' Gillig – Diesel - Low Floor	Cummins 6.7L L9 2022 / Allison B400R-6	Luminator Horizon Amber 16x160	Kenwood NX-800H	SpeakEasy 2	Doublemap System	Adaptive Micro Sys TDR80x7-.3A
2	2023, 35' Gillig – Diesel - Low Floor	Cummins 6.7L L9 2022 / Allison B400R-6	Luminator Horizon Amber 16x160	Kenwood (1) NX-800H / (1) NX-3820HG	SpeakEasy 2	Doublemap System	Adaptive Micro Sys TDR80x7-.3A
2	2024, 35' Gillig – Diesel - Low Floor	Cummins 6.7L L9 2024 / Allison B400R-6	Luminator Horizon Amber 16x160	Kenwood (1) NX-800H / (1) NX-3820HG	SpeakEasy 2	None	None
3	2023 Elkhart Coach – Gas -Ford E-450	Ford 7.3L (99N) / 6R140	None	Kenwood NX-800H	None	Doublemap System	Adaptive Micro Sys TDR80x7-.3A
2	2016, 26' Champion – Diesel – Titan II/ Chevy 4500	Duramax 6.6L / 6L90E	AESYS HG 3 Amber 120x16	Kenwood NX-800H	None	Doublemap System	Adaptive Micro Sys TDR80x7-.3A
1	2019, 26' Elkhart Coach – Gas - Ford E-450	Ford 6.8L (99S) / 6R140	Luminator Horizon Amber 14 x 112	Kenwood NX-800H	Jensen Adapter to Speakers	Doublemap System	Adaptive Micro Sys TDR80x7-.3A
2	2024, 26' Elkhart Coach – Gas - Ford E-450	Ford 7.3L (99N) / 6R140	Luminator Horizon Amber 14 x 112	Kenwood NX-800H	REI PA System	None	None

2.3 CITILINK FACILITIES

Citilink's main facility is located at 801 Leesburg Road. The administrative offices, maintenance area, body shop, and bus wash are located in the front building. The back building is the bus barn. The dispatch area is located in the admin offices and currently has one dispatch workstation and one customer service station.

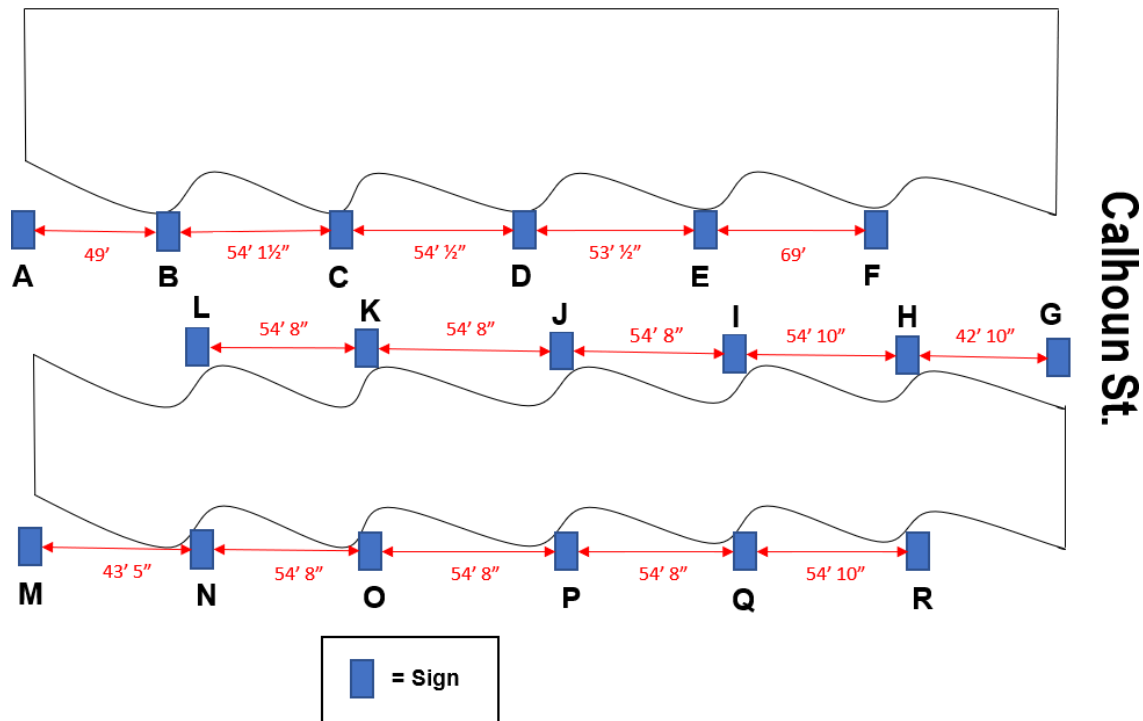
Citilink's main facility is shown below.



Citilink's second facility is the Citilink Central Station located at 121 West Baker Street. Central Station has a lobby area for passengers with two monitors that display information for passengers, an office area, one customer service station, and a break area for drivers. Central Station has 18 bus bays with electronic signs that will need to be replaced. The signs currently provide information such as route, route number, arrival time, and departure time. The Daktronics Galaxy AF-6300-32x144-8-A-DF signs are running Venus 1500 software and have static IPs. The Daktronics signs have a dimension of 16" in height, 48" in Length, and 10" in depth. They have an LED screen on the front and rear portion of the sign which displays the same message. These are attached to a metal beam that runs diagonally and are mounted using brackets. Two (2) brackets secure each sign. Measuring from the center line of each mounting shoe, they are 32" apart. The base plate of the mounting shoe that holds the sign is approximately 4" x 8". The signs have a 16" high x 14" long plate on the end which displays the bay's letter (Bays A-R). Shown below are the current Daktronics sign, Bay letter sign, and locations of the signs at Central Station.



Baker St.



2.4 CITILINK IT SYSTEMS

Citilink currently has a CAD/AVL system provided by TransLoc/Double Map to manage its bus fleet and provide passenger information. Citilink uses Remix as their scheduling software. The buses have a Safety Vision video camera system with HVR 4112 DVRs, Luminator and Aesys headsigns, Genfare Odyssey fareboxes, UTA APCs, Cradlepoint IBR900 routers. Most vehicles have Speakeasy 2 announcement systems and most have UTA APCs. Citilink is planning to run Token Transit validators in conjunction with the Genfare Odyssey fareboxes.

2.5 CITILINK VOICE RADIO SYSTEM

Citilink is currently leasing the use of digital trunked UHF voice radio system. Citilink has been allocated 11 talk groups. The buses have Kenwood NEXEDGE mobile radios, mic, and speaker. Nearly all the buses have Kenwood NX-800H radios, but Citilink will be transitioning to the NX-3820HG radios. The radios are currently mounted in the driver compartment.

The system has private call capability so that other drivers are not able to hear the conversation when a dispatcher initiates a call. Drivers can select an all call and all parties will hear the conversation.

2.6 CITS INSTALLATIONS

Citilink will make available one to four buses at a time for installations during working hours. Installers can utilize up to two bays if needed.

2.7 CITILINK WAN AND WLAN

There is point-to-point 500 MB fiber link between the main facility and Central Station that is leased from Comcast. Both facilities have internet connections — Comcast is the service provider.

Citilink has a wireless network established specifically for the Safety Vision camera system. It currently does not have an internet connection. This network allows the vehicles to communicate with the Safety Vision's Wi-Fi server. The wireless network can be configured to share the Wi-Fi system with the CAD/AVL system by assigning another CID or creating another subnet.

- Aside from the UniFi U6-PRO-US access points (APs) there is a wireless bridge UniFi UBB-XG-US creating the connection between both buildings.
- Citilink is using the UniFi Cloud Key UCK-G2-PLUS for accessing the APs and bridge.
- The AP's connection in the barn is typically contained inside the barn if all doors are closed and can extend further when garage doors are open.
- The AP connection in the maintenance shop reaches all the shop and when doors are open, a couple of feet outside on either side.
- The AP connection in the body shop is contained inside the body shop due to concrete walls.

The following figure shows the location of the access points at the Citilink facility.



2.8 SOFTWARE

2.8.1 Scheduling

Citilink uses Remix as their scheduling software for run cutting.

2.8.2 GIS

Citilink is working with Google to authenticate Citilink's GTFS static data which includes all information regarding the service, routes, bus stops, etc.

2.8.3 Maintenance

Citilink does not presently have any maintenance software. The maintenance department currently uses excel spreadsheets to track maintenance.

2.8.4 Website

Citilink currently provides route and schedule information to its customers via its website <https://fwcitilink.com/>. The website provides fare information, schedules and route information, a link to Google for trip planning, and links to sites for service providers that connect with Citilink routes. Citilink's website currently links to the Doublemap to provide real-time information.

2.9 IT SUPPORT

Citilink has an IT department and contractors that provide IT support.

2.10 IT STANDARDS

The following are Citilink's IT standards. All software utilized must be supported and upgraded/updated to stay in support.

- Windows based OS
- Server software (OS): Windows Server 2019 or later
- Virtual Environment software: VMware or Hyper-V
- Database software: MS SQL Server preferred
- Workstations: Windows Pro 10 or later
- Antivirus: Bit defender

3 CITS FUNCTIONAL REQUIREMENTS

3.1 DESIGN REQUIREMENTS

In an era of rapid technological advances and increasing interoperability requirements, the architecture of CITS must allow it to be easily maintained, upgraded, and expanded.

3.1.1 Capacity and Expandability

3.1.1.1 *Number of Buses to be Served*

CITS shall be capable of supporting the operation of and collection, processing, and reporting of CITS related data for a bus fleet that operates up to 100 buses in operation at once.

3.1.1.2 *Number of Buses Served during Pullout*

CITS shall be capable of supporting the power-up and pull-out of at least 100 buses in a one-hour period.

3.1.1.3 *Lines, Routes, and Runs*

CITS shall be capable of supporting the operation of and collection, processing, and reporting of CITS related data for a bus fleet that operates up to 20 routes, 40 sub routes and up to 400 runs represented by four-digit alphanumeric identifications. A sub route is a significant variation in the operation of trips on a route. A run is a collection of mutually exclusive revenue and non-revenue trips.

CITS shall be capable of supporting the operation of and collection, processing, and reporting of CITS related data for a bus fleet that operates “tripper” assignments.

3.1.1.4 *Operating Schedule*

CITS shall be capable of supporting a scheduled operating day that extends past midnight.

3.1.1.5 *Driver ID's*

CITS shall be capable of supporting up to four-digit driver ID's.

3.1.1.6 *Bus and Supervisor Vehicle ID's*

CITS shall be capable of supporting up to four-digit bus and supervisor vehicle ID's.

3.1.1.7 *CAD and Management Workstations, Tablets*

CITS shall be capable supporting at least four CAD workstation positions, including workstations located remotely; five management monitoring positions that provide access to all CITS information, and six Samsung Galaxy A9+5G Tablets with a mobile dispatching app that enable Supervisors to do basic tasks such as track buses and update detours while they are in the field.

3.1.1.8 *Nomenclature and Familiar Terms*

CITS shall utilize terminology that is specific to Citilink, as defined in this Specification and Appendices. Text for the GUI, labeling, messages, reports, manuals, etc., shall use terminology that is consistent with existing Citilink terminology. Examples include the following:

- Driver
- Operations Supervisor

- Paddles
- Buses
- Chief Safety Officer
- Route
- Passengers (not customers)
- Facility
- Vehicle Maintenance (Garage)
- Dispatcher
- Operations Manager
- Operations
- Maintenance Director
- Mechanic
- Silent Alarm

3.1.1.9 Expandability

CITS shall be designed to provide an efficient, effective, reliable, flexible, easily maintained, and expandable system.

CITS shall be designed to facilitate future expansion in functionality and transit operating conditions, with open, fully documented interfaces.

CITS shall permit expansion without upgrading initial equipment, without restructuring initial software, and with no more than 5% degradation in the latency of data to support the following:

- Six CAD workstations
- Eight management monitoring positions
- 100 operational vehicles
- 30 routes
- 50 sub routes
- 600 runs

CITS shall be designed to permit the addition of new functional capabilities over its lifetime without significant replacement of existing components. In particular, functions designated in this Specification as future or options shall be readily added to the system during its lifetime without costly rework or replacement of existing system components.

3.1.2 Open System Architecture

CITS shall be designed using off-the-shelf hardware and software to the maximum extent possible. CITS shall be designed using Open System Architectures and nonproprietary software allowing Citilink to develop system interfaces independently or enable integration with other internal or third-party systems. The Contractor shall identify any restrictions and document all protocols that Citilink would need to follow for the implementation of third-party integrations.

CITS shall use standard network communication protocols such as Transmission Control Protocol/Internet Protocol (TCP/IP) and system interfaces such as open database connectivity (ODBC) for databases. The Contractor shall document the database structures and any proprietary interfaces in their proposal.

3.1.3 Software

All software, including firmware, (other than off-the-shelf operating system software from third parties) furnished as part of CITS shall be developed in accordance with IEEE software quality assurance procedures and shall utilize modern software engineering techniques, such as client-server and object-oriented software architecture.

The Contractor shall utilize current standard operating systems such as Windows 10 Pro or 11 Pro, and Windows Server 2019 or later. Microsoft operating systems are required by Citilink.

Installation tools shall be provided to enable coordinated, rapid, and secure software updates to all vehicles and workstations.

3.1.4 Data Protocols

The data communications shall use an industry standard format such as Documented XML schema and use relevant TCP/IP and NTCIP standards.

Data protocols shall use 802.3 - 2022 IEEE Standards for Local and Metropolitan area networks and IEEE Wireless LAN 802.11 – 2021 or later.

IP for wide area network communications shall be utilized.

The latest versions TCIP, SAE, and EIA protocols shall be utilized for vehicle area network communications.

3.1.5 National ITS Architecture

CITS shall comply with the intent of the National ITS architecture. Use of NTCIP framework and data dictionaries as per TCIP Standards 1400 through 1408 and SAE J2496, inclusive is desired for open standards compatibility. For onboard equipment, use of SAE Standards J1708, J1939, and J1587 shall also be acceptable for open systems, particularly for interfaces to existing onboard equipment that are compatible with these standards. New data elements not covered by these standards shall be compatible with the framework of these protocols. ITS Interfaces

CITS shall be designed such that access to real-time information can be provided to other systems at Citilink (including electronic signs at Central Station), City of Fort Wayne, and the region's MPO NIRCC.

CITS information shall be available through the CITS Database for applications including, but not limited to, Google Transit, Transit App, and other third-party traveler information systems.

Future implementation of NTCIP-compliant center-to-center communications shall be facilitated through data stored in the CITS database.

3.1.6 Reliability, Availability and Maintainability

3.1.6.1 *Availability*

The Contractor shall submit reliability, availability, and maintainability data for CITS demonstrating compliance with the requirements.

The CITS system availability shall be 99.9% or better, excluding time used for periodic system maintenance or upgrades.

CITS shall include provisions to achieve high availability for critical functions through reliability of subsystems and system components, elimination of single points of failure, through self-diagnostics and reporting of failures, and through maintainability of CITS.

3.1.6.1.1 Data Communications

No single point of failure of CITS shall disable data communications from the dispatch area to the bus fleet, other than failure of the Onboard CITS equipment on a single bus or the data link for a single bus to the cellular carrier.

3.1.6.1.2 Workstations

Each dispatch workstation shall have all functions available at least 99.8% of the time, based on 24 hour a day operation, 365 days a year, excluding time used for periodic system maintenance or upgrades. At least half of the workstations shall have all functions available at least 99.9% of the time based on 24 hour a day operation, 365 days a year, excluding time used for periodic system maintenance or upgrades. No single point of failure shall disable cellular data communications at more than one dispatch workstation.

3.1.6.1.3 Onboard CITS Equipment

The full specified functionality for the Onboard CITS equipment for each bus shall be available at least 99.7% of the time, based on 24 hour a day operation, 365 days a year, excluding time used for periodic system maintenance or upgrades.

3.1.6.1.4 Data Logging

CITS shall correctly log data from buses, without lost events, at least 99.9 % of the time, based on 24 hour a day operation, 365 days a year. Measurement of this parameter assumes that the bus is within cellular coverage or Citilink's Wi-Fi coverage.

3.1.6.2 *Maintainability*

CITS maintainability shall support the specified availability requirements, given the expected equipment reliability. Maintenance requirements shall not increase by more than four percent annually as CITS ages.

3.1.6.2.1 Onboard Equipment

The entire Onboard CITS subsystem shall be constructed such that the average maintenance time for the Onboard Subsystem (including diagnosis, all repair and preventive [scheduled] maintenance time) by

personnel who have received and completed training provided by the Contractor is no greater than four hours per bus per year.

CITS shall display failures of Onboard CITS equipment to the driver.

3.1.7 Response Times

CITS shall correctly display a canned message at CITS workstations within five seconds with 99% probability and fifteen seconds with 99.9% probability of a canned message transmittal by a driver.

CITS shall report when a bus goes off route to the dispatch workstations within five seconds with 99% probability and thirty seconds with 99.9% probability.

CITS shall provide updated predictions for a bus on the CITS website within three seconds of receipt of updated location data from the bus.

CITS shall provide updated status for a bus on the CITS website, and app (option), within three seconds of receipt of updated location data from the bus.

CITS shall report the power up of a bus within five seconds of completion of on-board diagnostic tests with 99% probability and ten seconds with 99.9% probability.

CITS shall report a driver login and provide verification of the login to the driver within five seconds with 99% probability and ten seconds with 99.9% probability.

CITS shall display the complete tabular and graphical information on a dispatch workstation for a user after login within five seconds.

The CITS dispatch workstation shall display the login screen within two minutes from power-on or re-boot of a workstation.

The CITS dispatch workstation shall immediately accept (without noticeable delay) the entry of textual data without lost characters under all conditions.

The CITS dispatch workstation map displays including bus icons and other vehicle icons shall be completely redrawn, when panning, zooming, or jumping, within one second.

Response times shall be measured with the full operational fleet active, under normal operating conditions, unless otherwise specified.

Option: CITS shall correctly display a silent alarm switch (SAS) activation at CITS workstations within three seconds with 99% probability and ten seconds with 99.9% probability of an SAS activation.

3.1.8 CITS Interfaces

CITS shall interface with existing systems at Citilink as identified throughout this set of requirements.

The interface between the CITS and the Citilink Network shall enable an exchange of data with other Citilink systems.

There shall be bi-directional transfer of data between CITS and Citilink applications, including the following:

- Import of schedule information
- Import of route traces and GIS data

- Import of work assignments
- Import of employee's data including IDs
- Import of vehicle data
- Export of reports
- Export of real-time transit information (for customer information, wayside electronic signs, and management)
- Export of system alarms and diagnostics

The schedule import process shall provide a comprehensive listing of warning and error conditions.

Data produced by CITS shall be available to the Citilink Network for analysis and report generation.

CITS shall be configured such that CITS automatically initiates requests for information and completes data transfers without manual intervention.

CITS shall be configured such that CITS automatically processes updates to Citilink information including route, stop, schedule, vehicle, driver ID information.

The Contractor shall provide all necessary conversion utilities to provide data from CITS to Citilink applications in a format usable by the Citilink applications.

The Contractor shall provide security software to cover all virtual servers and a firewall/router to protect against unauthorized database access or modification from outside the CITS network.

CITS shall interface to multiple existing subsystems that are onboard each Citilink bus, including, but not limited to: internal LED sign, public address equipment, headsign, and engine control computer (option), transmission control computer (option), odometer and power supplies.

The Contractor shall develop interfaces for CITS with all existing equipment configurations of the Citilink fleet and shall develop, document, implement, and control all interfaces.

The Contractor shall be responsible for all Work necessary for a seamless CITS interface with existing bus equipment.

The Contractor shall develop royalty free APIs for CITS that other applications can access to retrieve a data from CITS including: Citilink route, stop, and static schedule information, real-time bus locations, predicted bus arrival times, and alert messages. The APIs shall support JSON or XML format and shall adopt the General Transit Feed Specification (GTFS) standard. The Contractor shall provide documentation regarding the standardized data interface formats (GTFS-Realtime, SIRI, or other standards).

CITS shall enable a system administrator to:

- Create, update, and remove API login ID and key credentials.
- View statistics of API bandwidth usage by user
- Limit API call records bandwidth by user

3.1.9 Graphical User Interface

The Contractor shall work with Citilink personnel to set the configurable portions of the MDT and Dispatch graphical user interfaces (GUIs).

CITS shall generally provide access to the most frequently used functions through a single layer of commands.

Option: The Contractor shall conduct at least one workshop with a Citilink focus group on the development of GUI details. The Contractor shall provide color drawings or mock-ups of proposed user interfaces for feedback from Citilink.

3.2 COMPUTER AIDED DISPATCH

3.2.1 Text Messages

CITS shall manage the stream of data messages from drivers, bus alarms and similar events, and present these as a queue.

CITS shall enable the transmittal of keyboard-entered and selected pre-defined text messages from any CITS workstation to the selected buses.

CITS shall enable all workstations to receive text messages from buses

CITS shall report to the CITS workstations

CITS shall allow users to append pre-defined text messages.

CITS shall receive and process text messages from CITS equipped vehicles.

CITS shall accept, under password control, designation of the user at any workstation as a dispatcher, Operations Supervisor, or Operations Manager.

If more than one workstation has accepted or been given assignment of a particular route, CITS shall make calls and status information for that route available to all assigned workstations.

CITS shall provide functionality to transfer a dispatcher's work assignment and calls to another dispatcher if the first dispatcher must temporarily leave his or her dispatch workstation. When a dispatcher logs off the CITS, the dispatcher's work assignment shall be automatically transferred to another active dispatcher.

CITS shall maintain a visible list of unacknowledged text messages and shall inform the workstation user when the acknowledgement has not been received within a system administrator-settable time.

CITS shall enable real-time text messaging between CITS workstations.

Option: CITS shall allow individual dispatcher assignments to be modified by the Operations Manager, such that subsets of routes and/or vehicles can be assigned to dispatchers, controlling the calls and status information received by each dispatcher.

Option: CITS shall enable a dispatcher at a dispatch workstation) to send a text announcement for display on the interior LED sign to a bus, subgroup, group, route, all buses.

Option: The queues for each user or workstation shall vary by the assigned work assignment.

3.2.2 Operations Status

CITS shall receive location and other data from the CITS equipped vehicles every 30 seconds or less and immediately report and display updated location and operational status (early/late) of each bus on the CITS workstations, website, and app (option). The update rate shall be configurable.

CITS shall display the conditions, location, and route/schedule adherence of buses at the dispatch workstation(s) to which they are assigned and the management workstations. The display shall be a combination of geographic and text/tabular presentation.

CITS shall automatically generate operations status entries when it detects an out-of-tolerance condition. The system administrator shall have the capability to set/adjust the tolerance parameters on a per-route basis.

As a minimum, CITS shall generate notifications for the following bus conditions:

- Off route
- Schedule adherence variance
- Uncorrelated vehicles operating outside a bus yard/barn
- Out late
- Cancel
- Missed relief
- Failure to communicate with bus
- Vehicle movements without a valid logon

CITS shall enable the setting of tolerances for determining each abnormal condition by the system administrator.

CITS shall enable the enabling or disabling of reporting of each condition shall be user settable, based on routes, vehicles, and times by the system administrator.

CITS shall accept logon inputs and validate driver-entered identification against assignment, route, run, and vehicle.

CITS shall supply information to bus drivers, dispatchers, and Operations Supervisors as needed to assist with schedule adherence, and schedule deviation recovery.

CITS shall validate driver logon data, alert the assigned workstation of out-of-bounds or inconsistent data, and allow for manual correction of data.

CITS shall report the entry of invalid driver identification to the dispatch workstation where the driver's bus is assigned.

CITS shall enable remote bus logon and the correction of invalid bus data at the dispatch workstation where that bus is assigned.

CITS shall designate a bus in an "uncorrelated" state when it is powered on but without a valid driver logon with a valid work assignment.

Dispatchers shall have the ability to correlate assignments.

CITS shall display the last known location of buses, supervisor, and other vehicles and change the icon color (configurable) if the location system of a bus stops reporting its location for a configurable period.

CITS shall include an interface to bus mechanical alarms and device alarms from bus subsystems such as onboard CITS equipment.

Alarms and equipment status data shall be provided for display at dispatch workstations via the cellular data communication system and the wireless network.

CITS shall provide the alarm and equipment status data to maintenance users and provide the ability to export reports.

The CITS workstations shall display selected lists of data, including bus schedules, driver identification, assignments and schedules, pull-in/layover status, back in service time/place, schedule and route adherence, and passenger loading.

CITS shall enable additions and amendments to any assignment of drivers, routes/runs, or vehicles from a CITS workstation.

CITS shall update all necessary locations after assignment changes have been made and ensure that all CITS components that may require this information have access to the updated information.

CITS shall store supervisor status messages received from supervisors. This information shall not be displayed in the call queues but shall be retained by CITS for use when a dispatcher attempts to contact the supervisor (option)

CITS shall facilitate the addition of buses to perform additional trips when there is an overload on a route. CITS shall calculate arrival predictions for the lead vehicle that is running in Add Bus Service and update the arrival predictions when there are missed trips.

CITS shall enable the Operations Manager to do the following at any workstation:

- make changes to schedule adherence tolerances
- make changes to load reporting tolerances
- view call queues

CITS shall accept, store, and display information to assist in making assignments and keeping records of drivers and supervisors. CITS shall display assignments of drivers to routes/runs, or vehicles on the CITS workstations.

CITS shall determine time based on GPS time and shall be displayed in a twenty-four-hour format for Eastern Standard Time or Eastern Daylight Time.

CITS shall provide automatic correction for daylight saving time.

CITS shall accept a silent alarm system (SAS) from a bus and immediately display this status with audio alarms, the vehicle ID, and current location on the dispatch workstation and update the vehicle location every five seconds while the SAS is active.

Option: CITS shall send an acknowledgement notification to the bus driver within fifteen seconds of a dispatcher acknowledgment of the silent alarm.

3.2.3 Geographic Display

CITS shall determine real-time locations for all CITS equipped vehicles; utilize the location data to calculate route and schedule adherence, and predict arrival times; and provide the information in geographic and tabular displays.

CITS shall correctly report real-time locations for all CITS equipped vehicles and accurately display this information within five meters.

CITS shall determine current time deviation from schedule for the assigned run, including late pullout status for each bus and provide the information in geographic displays.

CITS enables zooming, panning and scrolling of the geographic display and selecting the details of a displayed item shown at the zoom level.

The highest-level map display shall include all of the Citilink service area and portions of adjoining areas designated by Citilink that are up to ten miles beyond the service area.

The lowest level map shall show all streets, roads, railroad tracks, water boundaries, jurisdictional boundaries, bus stops, transfer points, and significant landmarks within the displayed area.

CITS shall enable the centering of the geographic display on a specified bus and tracking that bus automatically by panning and scrolling the display, as necessary.

CITS shall enable the centering of the geographic display on specified routes, stops, and time points.

All vehicle icons and associated text shall be easily legible without overlap at the lowest scale, even within high-density areas where many buses will frequently appear in the same area on the screen.

The bus icon shall resemble a bus and indicate the direction of travel.

CITS shall enable a text/tabular display of data for a particular bus when the bus icon is selected.

CITS map displays shall include a complete road map, as well as current route maps.

CITS map displays shall reflect all current or planned routes (including weekday, Saturday, Sunday, and Holidays).

CITS map displays shall display upon request: facilities locations, route instructions for route, operating procedures, and miscellaneous reference material.

Facility locations shall be displayed on the map.

Bus icons shall change color with status changes: (early, late, off-route, on-time).

CITS shall allow the user to select particular items (vehicle from a list, a specific landmark from a list, a street address, etc.) and then center the screen on that selected item. As for timepoints, CITS shall enable the user to zoom to a route and then to enable the display of the timepoints, such that the user shall see all timepoints for that particular route.

CITS shall enable supervisors to use a mobile dispatching app to view bus locations on their Samsung tablets.

Option: CITS workstations shall display a representation of the buses on a geographic map that include streets with names, routes, detours, and various jurisdictions.

Option: CITS shall correctly report real-time locations for all CITS equipped vehicles that are in the bus barn and Citilink Facility on geographic displays within five meters.

Option: CITS shall automatically center the display on a vehicle with an SAS status while the SAS is active.

Option: The colors for each status shall be system settable.

Option: CITS shall display, upon request, a route-oriented map and route ladder view that shows the location of buses relative to stops on a particular route. The route ladder view shall display the headway between vehicles on a particular route and aid the dispatcher in determining schedule adherence of the vehicles.

3.2.4 Tabular Display and Data Collection

CITS shall display messages received from CITS equipped vehicles and display them in a tabular view at the CITS workstations and on supervisor's Samsung tablets.

CITS shall record the following service changes, update the display of bus service status, and adjust AVA announcements.

- Deadheads
- Bumps
- Relays
- Doubles
- Out-lates / Cancellations
- Detours
- Assignment Cancellations
- Add Bus

CITS shall automatically collect and record bus status data, bus run, route and schedule deviation, time, bus driver identification, bus identification, location, bus alarm status, other pertinent bus information, system date and time, workstation identification, and dispatcher, Operations Supervisor, or police identification, and record them as part of each Incident Report(option).

CITS shall determine current time deviation from schedule for the assigned run, including late pullout status for each bus and provide the information in tabular displays.

CITS shall record onboard alarms reported by the Onboard CITS subsystems and the alarms shall be entered into queues on the dispatch workstations.

Option: CITS shall record wheelchair patron boardings and alightings recorded by the driver, and automatically attach the location, time, vehicle ID, route, run, and direction to the wheelchair data.

Option: CITS shall automatically record wheelchair ramp and bike rack activity with the location, time, vehicle ID, route, run, and direction.

Option: CITS shall store a summary of a call to police that is manually created by a dispatcher.

Option: CITS shall continue to alert dispatchers of an SAS invocation until it is acknowledged by a dispatcher.

Option: CITS shall force the creation of an incident report for each SAS invocation.

3.2.5 Option: Incident Reports

CITS shall provide maintenance users visibility on the Maintenance Workstation to vehicle information and Incident Reports to assess the need for road calls.

CITS shall allow maintenance users to subscribe to receive text and/or email alerts when maintenance related Incident Reports are generated. The Maintenance Workstation shall be configured to display maintenance-related events.

CITS shall facilitate the initiation of road calls by immediately transmitting selected Incident Reports that have the appropriate incident codes such as accidents to the Maintenance Workstation.

CITS shall create unique identification for Incident Reports as they are created.

CITS shall accept and record manually entered text, coded, combo-boxed or check-boxed notes, and an indication that the incident is closed or the report cancelled.

CITS shall maintain a log of assignments and any changes made to an Incident Report; recording the contents, time, and identification of the person logged in at the workstation where a change is made.

CITS shall provide a spell checker tool for manually entered text.

CITS shall enable accessing Incident Reports at all CITS workstations.

CITS shall enable Incident Report access shall be by bus driver identification, bus identification, route/run identification, dispatcher identification, incident code type, date, or Incident Report identification.

CITS shall also enable access to Incident Reports, which have been entered into a queue for reassignment or subsequent processing as described below.

CITS shall search through open Incident Reports and provide display of any potentially related Incident Reports to a dispatcher upon retrieval or closure of an Incident Report. The CITS workstation shall display associated Incident Reports in creation order, oldest first, to users with the proper access privileges.

CITS shall enable the assignment of an Incident Report from one dispatcher to another dispatcher or Operations Supervisor. CITS shall enter the Incident Report into the call queue of the recipient at its same priority and in the order, it was first received by CITS.

CITS shall enable the association of each Incident Report an incident code consisting of two levels of alpha/numeric characters. CITS shall maintain a database of codes and validate entries against that database.

CITS shall enable a selected set of these functions to send email and/or text notifications of need for follow-up actions on the Incident Report. CITS shall log these notifications.

CITS shall accept and record comment text made by a dispatcher, Operations Supervisor, or Operations Manager.

CITS shall include the routing of Incident Reports via a standard distribution list. Users with the appropriate access privileges shall be able to update the distribution list.

CITS shall enable a dispatcher to notify a specified individual or organization of an incident by forwarding the Incident Report to that individual or organization.

CITS shall have the capability to export, on demand, closed Incident Reports in a format that is acceptable to Citilink.

CITS shall enable Citilink users to access Incident Reports and other CITS data via remote access.

CITS shall maintain a copy of closed Incident Reports for at least five years and delete them when they have been archived after five years.

CITS shall provide pre-defined procedural checklists for selected types of incidents.

- The checklists shall direct the user to Incident Report fields as appropriate.
- The checklists shall include as appropriate, automatic links to various communications media such as telephone calls and email for others who may need to be notified about the incident.
- The checklist shall be cancelable at any stage.

Option: CITS shall automatically invoke an SAS resolution function regarding determination of the cause of the SAS as part of an Incident Report for any SAS. CITS shall hold the Incident Report open until the dispatcher has indicated whether the indication was valid or that it was a false alarm.

3.2.6 Bus Route, Patterns and Schedules

CITS shall have the ability to incorporate schedule changes either on demand or at a scheduled time. CITS shall automatically check changes for impacts to related CITS subsystems such as the traveler information and the Automatic Voice Annunciation subsystems.

CITS shall have the capability to make and/or accept changes to the bus route, pattern, and schedule data from a workstation for full or ad-hoc changes and detours at the trip, run and route levels.

CITS shall allow users to enter changes utilizing simple, menu-driven forms or to graphically enter changes by drawing a detour on a map. The data entered shall include the effective dates and pattern identifiers that identify the part of the schedule that is to be added or removed from effect.

CITS shall enable the archival of the detour for future use.

CITS shall provide a list of the schedule impacts that result from the bus route, pattern, and schedule changes.

CITS shall immediately pass relevant data about the bus route, pattern, and schedule changes to the appropriate CITS subsystems and external applications such as Transit App.

CITS shall utilize the modified definition of the route, pattern, and schedule for all CITS tracking, reporting and prediction functions for the duration that the modification is in effect.

CITS shall receive next day assignments of drivers to routes from Citilink and make this available at the CITS workstations and Maintenance Workstation. CITS shall accept cancellations of driver assignments.

CITS shall enable modifications to driver assignment data for the operating day.

3.2.7 CITS Reporting

CITS shall collect data for bus, staff, and CITS operation and performance and store it in the CITS Databases.

The Contractor shall supply tools for transferring CITS data to the CITS Databases and for the retrieval of all historical records from the CITS Databases for purposes of reporting.

CITS shall manage the historical records of events automatically created by CITS and manually entered data.

CITS shall include data management software to manage the entry, and manipulation of data and automate reporting for performance monitoring.

CITS shall provide dashboard type graphical reports to summarize fleet performance for Citilink management.

CITS shall provide reports on CITS system diagnostics.

CITS shall keep at least five years of recorded history available for immediate access from the workstations.

CITS shall automatically verify that it has successfully and accurately archived the data following any archive procedure.

CITS shall produce standard fleet management reports identified in this Specification.

CITS shall collect information for production of reports on:

- Trips, including trip ID, schedule type, route, run, direction, vehicle ID, driver ID, trip miles, deadhead miles, wheelchair boardings and alightings (option) and other pertinent information.
- Missed trips.
- Stops, including vehicle ID, route, run, time of stop (option), trip ID, and other pertinent information.
- Dwell time at each stop — Dwell time is calculated as the time the first door opens to last door closing at a stop.
- Distance traveled between stops.
- Timepoints, including vehicle ID, route, run, time of timepoint passage, trip ID, and other pertinent information.
- Vehicles, including location, mechanical alarms, emergency alarms, and schedule/route adherence for scheduled, unscheduled, and ad hoc runs.
- Road calls.
- Unusual operating conditions and detours.
- Current status of service (on 15-minute update cycle), showing any active SAS (option), number of buses currently on routes, percent of fleet on time, percent of fleet late, number of scheduled runs missed for the day, and total number of calls currently in queues.
- Onboard CITS equipment status, and other events.
- Summary reports based on trip number, route, run, day of week, period, driver ID, vehicle ID, schedule adherence, and wheelchair boardings and alightings (option). Summaries shall be for

weeks, months, quarters, and years. Summaries shall be provided for any system settable number of weeks, months, quarter, or years, up to five years.

- Option: Mechanical alarms and issues.

CITS shall enable the establishment of automatic daily, weekly, monthly, quarterly generation of reports and to email the reports in PDF formats to defined user groups.

CITS shall collect the necessary information and provide tabular and graphical reports on

- Bus assignments; including changes to assignments, pull-outs, and pull-ins.
- Driver assignments and logs of changes made to the assignments.
- Run cancels or out-lates.
- Service delays, including type, reason, length of delay, service loss, mileage lost, and resolution.
- Dispatch performance, as measured by call processing time categorized by problem type entered in the Incident Reports.
- Schedule adherence by stop and timepoint, including identification of events outside of adherence parameters.
- Layovers and recovery.
- Route deviations.
- Travel time and speeds.
- Driver logons by vehicle and by route.
- Collisions and accidents.
- General delays and trip delays.
- Onboard equipment issues.
- Communication status.
- Drivers including performance and incidents.
- AVL playback, which provides a graphical representation of vehicle locations for selected vehicle(s) on a map during a selected period.
- Running time by segment, route, direction, and time of day.
- Incident reports involving driver error.
- Accident reports.
- Option: Pre-trip reports.
- Option: SAS reports by driver and route.
- CITS prediction accuracy.
- Option: Webpage usage (visits per hour and day) number of concurrent webpage users per hour and sorted by zip code
- Option: Number of concurrent webpage users per hour and sorted by zip code.
- Option: SMS Usage (text requests per hour and day).

Reports shall be available for selectable periods, initially by month.

The CITS reports shall provide accurate information that reflects the CITS data with 99% accuracy.

CITS shall enable ad hoc selective retrieval of event records of bus, driver, supervisor, and dispatcher activities, by bus, driver, route, dispatcher, supervisor, and event type or time interval via a user friendly and efficient custom report generator.

CITS shall generate ad hoc reports in less than one minute.

CITS shall accept user-specified criteria for ad hoc reports, including the use of logical AND/OR drivers.

CITS shall enable reports to be available both at the workstation and able to be saved as a file.

Option: CITS shall collect the following types of CITS website user analytics data for production of reports on:

- Demographic data (ex. zip code) of the registered users
- General analytics data from registered and unregistered users, including demographic, geographic, technology, mobile, acquisition, behavior, and real-time analytics

3.2.8 Security

CITS shall limit access to its workstation functions and the Samsung tablets through password controls.

CITS shall permit access to features only to users who have presented the appropriate identification code and password for those features.

Access privileges shall be different for the user groups: Dispatcher, Operations Supervisor, Operations Manager, Maintenance Director, Manager, and System Administrator and any other user groups set up by the System Administrator.

CITS shall include a System Administrator role with access to all system functions, including configuration management and authority to set access privileges for other users.

CITS shall enable the System Administrator to define password groups and individual passwords for each user.

CITS shall enable each user to have a unique password.

The Contractor shall obtain a secure certificate that uses SHA-256 or stronger encryption algorithm for the CITS website. The Contractor shall install the secure certificate and shall ensure that the secure certificate remains valid. By default, the CITS website shall be accessed only via a secure (https) connection and all requests to visit the CITS website via an open (http) connection shall be automatically redirected to a secure (https) connection.

CITS shall utilize encryption to store all passwords.

3.3 DATA COMMUNICATIONS

CITS shall utilize encryption for all data communications.

CITS shall control all cellular data communications between the CITS computer subsystem and workstations and the Onboard CITS subsystems.

3.4 HOSTED COMPUTER SUBSYSTEM

The Contractor shall clearly define the approach for software hosting and access in their proposal. CITS shall be designed to be browser agnostic accessible and shall be accessible on standard web browsers Microsoft Edge, Google Chrome, Mozilla Firefox, and Apple Safari. CITS shall support access via the latest and recent versions of the browsers. The Contractor shall provide hardware, browser, and plug in requirements for CITS workstations.

Proposers shall describe how Citilink will be able to access data at any given time when the databases are located at the Contractor-provided data center. The Contractor shall be responsible for providing all licenses required for accessing databases and other applications to support data access. The online data storage system shall ensure data integrity if a computer disk drive fails by archiving transaction data or restoring data from an archive while the system is operating. It shall not be necessary to shut the database down while performing a successful backup operation.

The Contractor shall provide the details of the data center to be used and its security measures. The Contractor shall use at least two parallel data centers in two different geographic US locations.

CITS shall maintain the specified availability and reliability requirements with appropriate redundancy to avoid or minimize any failures as required to comply with the Agreement and Specifications.

- a) CITS shall run Contractor-furnished comprehensive self-diagnostics and security. When CITS detects unusual conditions or failures, CITS shall notify the system administrator and log the occurrence.
- b) Where redundant units are designed into CITS, CITS shall detect the failure of operating units and automatically switch to a working spare.
- c) CITS shall accomplish the switchover without disruption of operation or loss of operating data.

The Contractor shall provide an AVA Database Editor functionality a CITS workstation to enable Citilink staff to update the database utilized for AVA, including the recording of new digitized audio, application of the audio to the correct stop, application of the trigger point location for the audio announcement to the AVA database, and a tool to add, change, or delete messages, routes, and stop names for display on the onboard LED signs and headsigs.

Regardless of where the software and databases are hosted, Citilink shall own licenses to all products such that no new licenses need to be purchased when hosting location changes.

3.4.1 Performance Monitoring

The Contractor shall electronically monitor all CITS servers, routers, switches, data center security, and facility power 24 hours a day, 365 days a year. If there are any out of tolerance conditions with any server components, the Contractor shall automatically notify its technical support. The Contractor's technical support must respond to this notification of issues within one hour of notification.

CITS shall present all equipment alarms and diagnostic messages in a clear, organized, and consistent user interface.

CITS shall report equipment alarms in real time, including emails and SMS messages to maintenance personnel. Events that affect or may affect the ability of CITS to continue to operate as specified shall be considered alarms. Classification of events as alarms shall be configurable by the System Administrator.

3.4.2 CITS Software

The Contractor shall provide complete software to support all CITS functionality.

The Contractor shall provide interfaces to CITS through industry standard APIs.

CITS software shall be modular in design and shall be easily configurable by Citilink staff.

If applicable, the Contractor shall furnish the complete software, instructions, and data to reinstall and rebuild the CITS software installed on Citilink computers.

CITS shall use Microsoft operating system software.

At a minimum, the Contractor shall provide software that includes the following:

- Graphical user interface
- Network management system
- Database management system, including scheduled archiving and updates, and restoration
- Forms package, report package, and query package
- Software configuration management package
- Performance monitoring and reporting tools
- Equipment diagnostic software
- Firewall to protect against unauthorized database updates or accesses resulting in performance degradation

The Contractor shall provide software security which shall be provided in accordance with best practices from a recognized security-standards body.

3.4.3 CITS Databases

The Contractor shall use prescribed standards for SQL Server virtualization that are flexible enough to run in consolidated database environments with other applications using different schemas and virtualization.

The Contractor shall provide CITS Microsoft SQL databases that are designed to contain at least five years of data for the full CITS system.

CITS shall store and warehouse all CITS databases for five years.

The CITS databases shall allow multiple users to access the data in order to generate reports and statistical information, or extract data without impact on CITS performance for bus operations and traveler information.

CITS data shall be protected against accidental loss during movement from one database to another and backed up in case of a failure of a processor or hardware.

The data in the CITS database shall be in a format accessible through SQL.

The Contractor shall provide a data dictionary and definitions for the tables and databases so ad-hoc reports can be created by Citilink staff.

All parameters and functions needed for database administration shall be available to the CITS database administrator.

The Contractor shall not charge Citilink or others to access CITS data.

The Contractor shall be responsible for the creation of the initial version of the route and schedule database for CITS that will be utilized for the implementation and system acceptance testing. Citilink will

provide Contractor with route and schedule information generated by Remix and GIS information collected to date. The Contractor shall utilize the current data provided by Citilink, correct any inaccuracies, and ensure the data is complete and up to date.

The Contractor shall be responsible for the creation of the initial version of the AVA database that will be utilized for the CITS implementation and system acceptance testing. The AVA database shall include the trigger locations for the announcement of all stops, the audio file for the each stop announcement, and the stop announcement message to be displayed for each stop. The trigger locations shall be established so passengers will have adequate time after the stop announcement is played to prepare to disembark at the next stop. Trigger locations shall be subject to Citilink approval.

The AVA database shall also contain data files for audio and visual public service announcements and trigger locations for them. Each audio announcement shall be up to 30 seconds in length and shall include the stop designation such as the complete intersection name or landmark name. The visual announcements shall correlate to each audio announcement. The Contractor shall submit for Citilink approval sample tapes of the audio to be furnished. The audio files shall be recorded in a manner that would allow Citilink to easily truncate or append announcements. The Contractor shall submit for Citilink approval the exact text to be used for each new stop announcement or general service message. The distance from the stop where the next stop announcement is triggered shall be selectable by stop and direction or applied globally. The AVA database shall include data files for audio and visual announcements that are made onboard at X minute intervals, where X is adjustable by the system administrator.

The Contractor shall provide tools to maintain and update the CITS databases. The tools shall include a GIS tool for the route database and a tool to import Citilink generated updated Citilink routes, schedules, vehicle and employee lists, and bus stop information.

The Contractor shall provide complete version control and validation of the database.

3.5 WIDE AREA NETWORKING

If applicable, the Contractor shall utilize industry standard wide area networking (WAN) hardware to extend the CITS LAN at the Facility to the hosted site for the CITS Computer subsystem.

If applicable, the Contractor shall establish a CITS LAN and configure it to be fault tolerant. When the primary communications path fails, data communications on the WAN shall automatically utilize a secondary path.

If applicable, the Contractor shall use commercially available bridges, switches, firewalls, and routers from a recognized vendor with a solid support group and local parts for warranty support.

Option: The Contractor shall establish a redundant P2P Ethernet connection to the hosted site.

3.6 ONBOARD SUBSYSTEM

3.6.1 Status

The Onboard CITS subsystem shall report its current location, velocity, direction of travel, and other vehicle information to the CITS Computer subsystem every 15 seconds or less and include this information whenever status messages are transmitted.

The Onboard CITS subsystem shall reliably provide location information when the bus is in buildings, tunnels, or in extreme multi-path locations for GPS signals and meet the accuracy requirements in the specifications.

The Onboard CITS subsystem shall respond to queries from the CITS Computer subsystem and include its current location information.

The Onboard CITS subsystem shall transmit an "active" vehicle status when the bus is powered up and "inactive" when the bus is powered down to the CITS Computer subsystem.

The Onboard CITS subsystem equipment shall remain active when the bus is shut off at a layover. The length of time a bus remains active shall be configurable by the system administrator.

The Onboard CITS subsystem shall be capable of providing an inter-lining or deadhead status to the CITS Computer subsystem.

The Onboard CITS subsystem shall locate vehicles with the accuracy necessary to support AVL-related functions including activation of AVA announcements within 10 meters of the trigger point location for each announcement.

The Onboard CITS subsystem shall locate vehicles with the accuracy necessary to determine when the vehicle is off route by more than thirty feet with 99% probability.

The Onboard CITS subsystem shall locate vehicles with the accuracy necessary such that less than 1% of all off-route notifications are false.

The Onboard CITS subsystem location information shall be utilized to calculate route and schedule adherence, to trigger stop announcements, and to predict arrival times.

The Onboard CITS subsystem shall determine times for stops, dwell times at stops, start of assignment, pull-ins, pull-outs, start of trip, layover on assignment, end of trip, and end of assignment and shall report deviations to the CITS Computer subsystem.

The Onboard CITS subsystem shall report its schedule adherence to the CITS computer subsystem if the schedule deviation is more than a predefined threshold early or late.

The Onboard CITS subsystem shall determine the bus location, and stop, whenever there is a door cycle or there is a stop exceeding a system administrator-settable number of seconds.

The Onboard CITS subsystem shall transmit the off-route status to the CITS computer subsystem.

The Onboard CITS subsystem shall require a driver or maintenance personnel to log onto a bus before accepting any other request through its MDT.

The Onboard CITS subsystem shall monitor the status of all Onboard CITS components) to detect failures, disconnected equipment, or missing equipment. The location and the time when the condition occurred shall be recorded with the event. Detected failures shall be retained onboard the bus and downloaded at the end of revenue service when the bus is in the bus yard. Major failures shall be reported to the CITS Computer subsystem in real time. Detected failures shall also be reported to the CITS Computer subsystem when requested or scheduled. The type of reporting (real-time, as requested, or as scheduled) shall be selectable for each piece of Onboard CITS component.

The Onboard CITS subsystem shall utilize the cellular data network established by Citilink for data communications with the CITS Computer system.

The Onboard CITS subsystem shall accept text messages sent from a CITS and display those messages to the driver on the MDT.

The Onboard CITS subsystem shall enable the driver to send a driver-selected text message from a set of canned text messages to the dispatcher via the MDT.

The Onboard CITS subsystem shall automatically transmit messages indicating activation of an onboard alarm that is being monitored by CITS. The reporting of the alarms shall be disabled for a selectable period following start-up to prevent false reporting. Onboard alarms shall have occurred for a period of at least two seconds to be considered a valid alarm for reporting.

The Onboard CITS subsystem shall transmit data collected when requested by a CITS workstation or during a regularly scheduled download, typically at the end of revenue service when the bus is in the bus barn. The location and time of the data transmittal shall be recorded with the event.

The Onboard CITS subsystem shall perform a verification of downloads of data to the CITS Computer subsystem.

Option: The Onboard CITS subsystem shall enable vehicles to transmit SAS data messages via the cellular network.

Option: The Onboard CITS subsystem shall automatically transmit a silent alarm notification when the driver presses the silent alarm switch, place the Onboard CITS system in silent alarm mode, transmit vehicle location information every five seconds.

Option: The Onboard CITS subsystem shall accept inputs by the driver for an electronic pre-trip report. The pre-trip report shall mirror the pre-trip report that drivers are currently required to complete before pull-out. The items included with the pre-trip inspection shall be configurable. CITS shall automatically populate certain fields of the report such as bus ID, driver ID, and date and time.

Option: The Onboard CITS subsystem shall require the driver to complete the pre-trip report before closing the report and performing other functions.

Option: The Onboard CITS subsystem shall store the completed pre-trip report onboard and transmit the report via the wireless network before the bus leaves the facility.

Option: The Onboard CITS subsystem shall automatically transmit a message that indicates if a pre-trip report was not completed by the time the bus leaves the facility.

Option: The Onboard CITS subsystem shall allow a relief or other driver to add to the initial pre-trip report. The initial pre-trip report cannot be changed. The edited report shall indicate the additions made by a new driver and the new driver's ID number.

3.6.2 On-Board Processor

The Onboard CITS subsystem shall use the Onboard CITS Processor to directly or indirectly record and store data received from the sensors, GPS receiver, spread spectrum radio, and dead reckoning system.

Option: The Onboard CITS subsystem shall receive and store wheelchair actions, and other onboard data from existing onboard systems and have capacity to interface with future onboard systems.

The Onboard CITS subsystem shall store and maintain a copy of the current system-wide route and schedule in the Onboard CITS equipment.

The Onboard CITS subsystem shall store driver work assignments onboard or receive the driver work assignment from the CITS Computer subsystem.

The Onboard CITS subsystem shall control the existing headsigns such that the headsign displays the correct route and final destination and the most travelled street or City that corresponds to the driver's work assignment, "Special Run" or "Out of Service" status, or special service messages. If applicable, CITS shall also control additional onboard signs to display the correct route number and/or destination.

The Onboard CITS subsystem interface to the headsigns shall not interfere with the manual operation of the destination signs nor degrade their performance.

The Onboard CITS subsystem shall accept updates to the onboard databases via the wireless network and via the cellular data communication subsystem.

The Onboard CITS subsystem shall accept downloads of new versions of the database via the wireless network.

The Onboard CITS subsystem shall utilize inputs from an onboard GPS receiver, odometer, and gyro to determine the vehicle's location.

The Onboard CITS subsystem shall transmit AVL information and store AVL information onboard if communications are lost and transfer stored AVL information when communications are restored.

The Onboard CITS subsystem shall store the AVA database for audio and visual onboard announcements.

The Onboard CITS subsystem shall be synchronized to GPS time.

Option: A dead reckoning algorithm shall be used to determine the vehicle's location when the GPS signal has been lost.

3.6.3 Mobile Data Terminal (MDT)

The MDT shall accept logon inputs and provide notification to the driver whether or not the logon was accepted.

The MDT shall make an audible and visible annunciation when a text message requiring an acknowledgement has been received.

Drivers shall be able to view multiple messages on the MDT.

The MDT shall enable for the reading and acknowledgement of messages received. The available messages shall scroll on the MDT display for selection by the driver.

The Onboard CITS subsystem shall determine and display on the MDT the current deviation from schedule for the assigned run, including late pullout status.

The MDT shall enable drivers to initiate public service announcements from a menu of predefined messages. These announcements shall override automatic announcements. The Onboard CITS subsystem shall replay the overridden message after the driver-initiated announcement has been completed.

The time displayed on the MDT shall be within one second of the time displayed on the dispatch workstations when the onboard subsystem is receiving a GPS signal.

The MDT shall enable drivers to log wheelchair boardings by sending a canned message to the CITS Computer subsystem.

The MDT shall provide the driver with a visible indicator if the bus is off route, further than a pre-defined threshold, and shall remove the name of the next stop displayed on the interior sign and suppress audio announcement for the next stop.

The MDT shall normally display the current time for the driver. CITS may supersede this display with other information as required, but the display shall return to time when the superseding information is no longer needed.

If the GPS signal is lost, the Onboard CITS subsystem shall maintain time to within 10 seconds per month of drift.

The Onboard CITS subsystem shall enable a driver to log off via the MDT and report the change of status to the CITS Computer subsystem.

The MDT shall display status messages of the cellular data system, and key Onboard CITS components on the MDT.

Option: The MDT shall display the items to be checked by the driver for the pre-trip report and accept entries from the driver to indicate the status of the items checked

Option: The Onboard CITS subsystem shall determine and display on the MDT the turn-by-turn directions for the assigned run or detour.

Option: The MDT shall discreetly display an indication that a silent alarm notification from the vehicle has been received and acknowledged by a dispatcher.

Option: The MDT display shall return to normal when the silent alarm status has been cleared by a dispatcher.

3.6.4 Automatic Voice and Text Announcements

The Onboard CITS subsystem shall interface to the existing onboard LED sign and the PA system to provide for an automatic announcement of each upcoming stop, stop requested, and other general service announcements in both audio and visual formats. The next stop announcements and other announcements shall be made at predefined locations that are stored in the AVA database.

The Onboard CITS subsystem shall cease displaying "Stop Requested" on the LED sign when a door is opened.

The Onboard CITS subsystem shall make an announcement of the route and destination using the exterior speaker immediately after the doors open at a bus stop. The exterior announcements shall be disabled during the night and early morning hours.

The Onboard CITS subsystem shall provide accurate announcements — for 99% of the time, the Onboard CITS subsystem shall automatically make the correct stop or other announcement at the proper location without any action required by the driver.

Drivers shall not be able to disengage AVA operations.

The Onboard CITS subsystem shall allow, through the PA microphone, instant driver-voice override for emergency or priority announcements. The voice override shall be activated with a PA mic switch and shall automatically time-out after 30 seconds. The Onboard CITS subsystem shall record and store the override as an event in an event log. The Onboard CITS subsystem shall replay the overridden message after the driver voice message has been completed.

The Onboard CITS subsystem shall make ambient noise measurements to provide independent, automatic volume control for internal and external announcements. Audio levels shall be controllable by the driver within a usable audio range via the MDT.

The Onboard CITS subsystem shall be capable of repeating audio and text stop announcements.

If the bus goes off-route, the Onboard CITS subsystem shall stop making next stop announcements until it determines the bus is back traveling on the assigned route.

The Onboard CITS subsystem shall continue to make the correct announcements in the event a stop is bypassed or the bus switches from one route to another.

The Onboard CITS subsystem shall cease to make announcements when a driver changes the bus status to out-of-service. The headsign shall display "Out of Service."

The Onboard CITS subsystem shall display a time, date, and text announcements periodically on the internal signs.

The Onboard CITS subsystem shall make the correct stop announcements when the bus has been placed into service to provide additional unscheduled service on a route.

Option: The Onboard CITS subsystem shall display text message announcements from dispatchers on the onboard LED sign and/or headsign.

Option: The hours when the exterior announcements are disabled shall be a system settable parameter

3.7 BUS FACILITY SUBSYSTEM

The Contractor shall provide a Maintenance Workstation or utilize an existing Citilink workstation in the maintenance area to function as the CITS Maintenance Workstation. The CITS Maintenance workstation that shall perform dual functions as the server to facilitate and manage the transfer of data between buses and the CITS Computer subsystem via the Citilink wireless network and as a CITS workstation that will be used by the Citilink Maintenance Director to view bus locations and status, review vehicle information, and generate management reports.

The CITS server/workstation shall be located in the maintenance area. The data transferred via the wireless network shall include the following:

- Download route and schedule adherence from the bus
- Download vehicle health data from the bus
- Upload route and schedule, AVA, and other database updates to the bus
- Download Onboard CITS equipment alarms, and other events requiring maintenance action
- Option: Download pre-trip checklist reports

3.7.1 Option: Record and Report Bus Locations and Bus Actions in Facility

CITS shall determine and record bus ID, location, and sequence as they are parked in the facility. CITS shall produce reports of the location of buses in the bus barn and facility, available buses, unavailable buses, and driver's bus assignments.

CITS shall record bus movements within the bus barn and facility and when they enter and leave.

CITS shall record the events and times for a bus at each work location, including fueling and maintenance. CITS shall produce reports on the bus movements and events, including logs by bus and by location.

3.7.2 Option: Bus Assignments in Facility

CITS shall maintain a bus barn and facility plan, showing the current bus locations, availability status, and assignments of buses to drivers and driver work assignments. This plan shall be available for display on all CITS workstations in graphical and tabular format.

CITS shall automatically assign buses to drivers based upon their work assignments and pullout time, the location of the buses, Citilink's list of preferred buses for each route and Citilink list of buses on hold.

CITS shall assign buses for unscheduled work assignments or accept bus assignments made manually on a CITS workstation.

CITS shall maintain a log of the assignments for display on CITS workstations and for export to other CITS systems.

Citilink shall enable bus to route assignments to be entered on any CITS workstations or the CITS Maintenance Workstation.

3.7.3 Wireless Network LAN Interface

The Contractor shall utilize the Citilink wireless network to enable a wireless data exchange between the CITS Computer subsystem and the Onboard CITS subsystems while the buses are in the bus barn and facility.

CITS shall include a wireless network management tool to:

- Monitor and manage the data uploads and download with the buses
- Provide log of files uploaded and downloaded to the buses and logins
- Resume a download or upload that was halted without requiring restart
- Option: Monitor the health of the wireless network

3.8 TRAVELER INFORMATION SUBSYSTEM

3.8.1 Time of Arrival Predictions

The CITS system shall reliably determine the real-time arrival times of the next three buses arriving at each stop. The predictions for each bus shall be updated every 30 seconds or less. CITS shall accurately update its predictions within 10 seconds when a bus is removed from service, when a new bus is placed in service, when a bus detours/goes off route, and will miss stops because the bus is turning short.

CITS shall indicate the number of minutes from arrival time for arrivals in less than 20 minutes and the arrival time for arrivals greater than 20 minutes.

The accuracy of the predictive algorithm shall be such that the predicted error shall be:

- Less than one minute 90% of the time when a bus is predicted to be three or less from a stop
- Less than 75 seconds 90% of the time when a bus is predicted to be three to five minutes or less from a stop
- Less than three minutes 90% of the time when a bus is predicted to be between six to ten minutes from a stop

CITS shall reset predictions for a stop within 10 seconds after a bus departs from the stop.

CITS shall also calculate time of departure information. CITS shall have the option to display time of arrival or departure information or both. The Contractor shall initially configure CITS to display the arrival times.

If there is an active detour on the bus route, the CITS predictive algorithm shall produce a prediction based on the detour route and remove predictions for all stops that are bypassed as a result of the detour.

When a bus is off route, the CITS shall remove all predictions for stops that will be bypassed by the bus as soon as the off-route condition is detected by CITS.

CITS shall utilize Citilink's databases, if available, for bus stop identifiers such as ID, street location, route, and direction. If ID numbers have not been established for Citilink's bus stops, the Contractor shall create ID numbers for them and submit them to Citilink for approval. The Contractor shall minimize the number of databases to be maintained by Citilink staff.

The prediction accuracy requirements shall apply to predictions for buses that have been inserted into the service.

Option: The CITS predictive algorithm shall be a learning algorithm that considers historical data collected for the stop location, route, and the time of day, day of week, and week of year.

Option: The CITS predictive algorithm shall consider traffic conditions (both live traffic and predictive traffic if available) along the route of the bus.

3.8.2 CITS Website

The Contractor shall provide a link to a CITS website that provides time of arrival predictions for all Citilink stops to be placed on the Citilink website.

Users shall be able to access the website using all major browsers using the latest two versions of each browser using desktop computers and mobile devices, including laptops, tablet computers, and smartphones.

All users, regardless of their web browser or device, shall be allowed to access the CITS website via the same URL and have access to all functions and features of the website.

The website shall contain no broken links nor infinite redirect loops.

The CITS website shall have a responsive design such that screen layouts are developed for the various browser window widths of the devices and are adaptive to the user's device screen width.

All user text entry forms for the CITS website shall use a text font size of at least 16 points, so that text on a mobile device in the web browser will not require the user to zoom in.

The website shall provide the following features for all users:

- Search and View Bus Stops and Bus Routes
- Real-Time Bus Arrival Times
- Real-Time Bus Locations
- Real-Time Traffic Conditions (option)
- System Alerts

CITS shall enable a system administrator to manage and maintain the CITS site and perform the following:

- Search for users by name, email, or phone number (option)
- View registered user and their details, including (option)
 - User's name
 - Users' email address and/or mobile phone number
 - User's favorite routes and stops
 - User's login history, including time stamp and IP address
- Option: Initiate a password recovery process for a user (in addition to the automated process).
 - All user's password information shall be encrypted so system administrators shall not be able to view user's password.
 - System administrators shall not be allowed to establish a user's password.

The CITS website shall meet the following performance requirements:

- All CITS website pages shall be completely loaded within 3 seconds when accessed from a network with download speed that is equivalent to a 4G LTE cellular data connection.
- All CITS website map displays shall be completely redrawn within 2 seconds, after panning, jumping, resizing, or zooming when accessed from a network with download speed that is equivalent to a 4G LTE cellular data connection.

Option: CITS shall provide a trip planner that incorporates real-time arrival CITS data.

3.8.2.1 Search and View Bus Stops and Bus Routes

CITS shall seek permission from the user to obtain the user's location in order to provide location-based information. If permission is granted, the CITS website shall enable users to view Citilink bus stops and bus routes that are in the vicinity of the user's location on a map display. A default zoom level shall be set so that upon the loading of the page, the user will see at least an area of 1/2 mile x 1/2 mile on a mobile device screen that is 640 pixels wide. Users shall be able to zoom in and out and pan on the map display to search for Citilink bus stops and bus routes. Users shall also be able to search for a bus stop by entering a route, direction of travel and selecting the desired bus stop from a pulldown list or search by intersection. The pulldown list shall list the bus stops in sequence (or in order of proximity when user

provides location) and provide location information such as stop name, route and direction, and a stop ID number. There shall be a bus stop icon for each bus stop on the map display. The bus stop location, stop ID number, and routes served shall be displayed when users mouse over the icon.

3.8.2.2 Real-Time Bus Arrival Times

The CITS website shall display real-time predicted arrival times for the next three available buses for each route that services a Citilink bus stop that has been selected by the user. Users shall select a bus stop either by double clicking on a bus stop icon in the map display, selecting a stop from a pull-down list or by entering a bus stop ID number in a Bus Stop ID box.

The Bus Stop ID box shall be coded with an autocomplete feature so that users can select from previously entered bus stop ID numbers without having to re-type the full ID. The bus arrival times shall be displayed in chronological order by route, with the first bus that is predicted to arrive at the top.

The time of arrival predictions announced by the website for an approaching vehicle shall be updated within five seconds after the CITS Computer system receives a location update from the vehicle without the user having to reload/refresh the page. In the event real-time arrival information for the approaching bus is not available, CITS shall either default to displaying the static schedule and indicating it is not real-time data or not displaying any information.

3.8.2.3 Real-Time Bus Locations

The CITS website shall be capable of displaying real-time locations of Citilink buses that are in the vicinity of the user's location, a stop location selected by the user, or the buses currently in the field of view of the map display viewed by user. The buses shall be represented by a bus icon that is approved by Citilink. Users shall be able to view the location of an arriving bus at a stop by selecting the predicted arrival time. The default zoom level for the display of a bus on the map display shall be appropriate so the streets in the vicinity of the bus are readable. Users shall be able to view the locations of additional Citilink buses by zooming out.

3.8.2.4 Option: Real-Time Traffic Conditions

The CITS website shall enable users to view color coded real-time traffic conditions on the streets that are in the field of view of the map display viewed by user. The color coding shall be consistent with the color coding used by the maps.google.com website.

3.8.2.5 System Alerts

The CITS website shall display system alerts on all CITS front-end web pages. The alert text shall be boldly displayed as a banner located at the top of a web page when there is an active system alert.

The alert texts shall be displayed in a rotating manner or list view when there are multiple active system alerts.

If an alert becomes active after a web page has already been opened, the web page shall display the alert without requiring the user to reload the web page. The system shall either trigger the web page to be automatically reloaded or shall use technologies such as AJAX to automatically insert the newly active alert into the web page without the page reloading.

If an alert becomes inactive after a web page was opened, the web page shall cease displaying the alert without requiring the user to reload the web page.

3.8.3 Option: Schedule Inquiry by Text Messaging

CITS shall enable mobile phone users to make a schedule inquiry via text message to a special CITS number.

Option: The Contractor shall install signs at all bus stops that serve Citilink buses. The signs shall list the number to text for arrival information and the bus stop ID.

CITS shall send a response within 1 second of receiving a user's text message inquiry. The text message response from CITS shall contain the following information:

- bus stop name
- bus route number and direction.
- bus agency identifier if the service is not provided by Citilink
- predicted arrival time of the next three buses in minutes.
- if real-time data is not available, static scheduled arrival time with an indication the information is not real-time.
- additional commands that the user can use to request updated (refreshed) arrival times and to save the request.
- appropriate error messages if the user's inquiry is not understood by the CITS or the bus stop number submitted does not exist.

The text response from CITS shall not exceed 160 characters. If a text response to an inquiry were to exceed 160 characters due to the number of routes included, multiple text messages will be sent in response.

CITS shall send first time users a response that includes a notice that the user may be subject to SMS fees by the mobile carrier.

3.8.4 Mobile app

The Contractor shall develop a CITS native mobile app for smartphone and tablet users and perform all tasks to implement the app. The Contractor shall provide at a minimum, an iOS and an Android version of the mobile app. Both versions of the mobile app shall utilize the full area of mobile phone screen, regardless of the brand and model of the mobile phone.

The CITS mobile app shall enable users to do the following:

- view bus stops in the vicinity of the user's GPS-enabled location on a map.
- view the predicted arrival times at a stop selected by the user for the next three buses of each bus route serving the bus stop.
- view real-time bus locations on a map.
- receive messages that are broadcast by CITS to all system users.
- receive messages that are broadcast by CITS to users who are located on specific routes.
- Option: view real-time color-coded traffic on a map

CITS shall enable mobile app users to select bus stops that are not in the immediate vicinity of a user's location by moving the map to view a desired location and/or by entering a desired bus stop number.

CITS shall enable mobile app users to zoom in and out on the map.

The time of arrival prediction announced by the app for an approaching vehicle shall be updated within five seconds after the CITS server receives a location update from the vehicle. The predictions displayed on the app shall be identical to the predictions provided on the website at least 99% of the time.

CITS shall enable mobile app users to perform all functions that registered users can perform on the website.

Option: CITS shall enable mobile app users to save favorite trips without having to register for an account.

Option: CITS shall enable mobile app users to view information regarding favorite trips without having to login.

3.8.5 Electronic Signs at Central Station

CITS shall enable the display of time of arrival information on 18 two sided electronic signs that shall replace the Daktronics signs currently installed at the Central Station. The information displayed on each sign shall pertain to the buses arriving at the sign's bus bay and the same information shall be displayed on each side of the sign.

The electronic signs at Central Station shall provide dynamic time of arrival information for bus lines that serve the location that the sign provides information for, and shall be capable of displaying system alerts, date and time, and other general service messages.

In the event that AVL information for the approaching bus is not available, the signs shall default to either displaying the static schedule or not displaying any information. The default shall be a system settable parameter. The signs shall indicate on the sign whether or not live data is being displayed.

The electronic signs shall provide continuous, unattended, and stable operation. The time arrival displayed on the signs shall be updated every ten seconds or less and within five seconds after the CITS server receives a location update from the vehicle. The predictions provided on the signs shall be the same as the predictions provided on the website 99.99% of the time. Proposers shall provide details on how quickly CITS shall reset the electronic signs when a bus departs from a stop.

The electronic signs shall automatically adjust its brightness to ambient conditions to ensure optimal visibility. In addition, the display signs and monitors shall meet applicable ADA requirements for character size and general readability in bright sunlight and low light conditions.

Option: The Contractor shall provide and install signs that have a 16" high x 14" long plate on the end which displays the bay's letter (Bays A-R).

Option: The electronic signs shall be capable of providing audible announcements of all data displayed on the signs. Audible announcements shall be manually triggered by patron action at a stop. The electronic signs shall make ambient noise measurements to provide automatic volume control. Volume ranges shall be a system settable parameter and shall be configurable based upon the time of day.

Option: The electronic signs shall display text messages created by a dispatcher or supervisor. The messages shall be displayed on a user defined schedule—up to thirty days in advance. The system admin shall be able to designate which signs shall display a specific message.

Option: CITS shall allow a CITS administrator to monitor the status of the electronic signs. The electronic signs and all related hardware shall perform self-diagnostics and shall automatically report diagnostic information to the CITS for logging. When CITS detects unusual conditions or failures, CITS shall notify the system administrator and log the occurrence.

4 CITS HARDWARE REQUIREMENTS

4.1 WORKSTATIONS AND TABLETS

The Contractor shall enable access to CITS software on Citilink workstations. The workstations currently have Windows 10 Pro operating systems and will be migrating to Windows 11 Pro. The Contractor shall provide in their proposal the computer hardware, browser, and plugins requirements for CITS to operate on the Citilink workstations.

The Contractor shall enable access to CITS on Samsung A9+5G Tablets currently being used by Supervisors in the field. The specs for the tablets are:

- Screen Size: 11"
- Model: SM-X218U (SM-X218UZAATT)
- RAM: 4GB
- Storage: 64GB
- Service provider: FirstNet

4.2 COMPUTER SUBSYSTEM EQUIPMENT

The CITS Computer Subsystem, including servers and related equipment shall be located and maintained by the Contractor at two redundant hosted US sites proposed by the Contractor and connected via WAN to the workstations at the Citilink Facility. The CIT Computer Subsystem and peripheral devices shall be commonly used, current, and commercially available off-the-shelf equipment; that utilize current versions of software, and current Windows operating system, and are subject to Citilink approval. The hardware and software provided shall have at least five (5) years from End of Life/End of Support (EOL/EOS). If required, the Firewall/Router shall be from a recognized vendor with a solid support group and access to local parts/warranty support. The CITS Computer Subsystem shall be configured for high availability and operational flexibility, using the most current versions of the current commercial technologies, including a virtual server environment and shared external SAN storage.

Servers shall have the hardware and software necessary to allow archiving and restoring data to an external digital medium. Archiving shall be configurable to operate automatically on a periodic basis. CITS shall automatically notify the appropriate personnel when a manual task is required such as loading new media into a backup drive.

The Contractor shall implement an Uninterruptible Power Supply at the hosted site to handle the electrical load for the CITS Computer Subsystem for a minimum of 60 minutes.

The Contractor shall provide server-monitoring software.

4.3 DATA COMMUNICATIONS SYSTEM INTERFACE

The Contractor shall perform all tasks to utilize the existing internet connection at Citilink for CITS.

The Contractor shall perform all tasks to interface with the existing wireless network at Citilink for CITS.

The Contractor shall perform all tasks to interface CITS to the existing cellular data network to enable data communications between the buses, CITS workstations, and the CITS Computer subsystem. The correct operation of the interface shall be thoroughly verified by the Contractor.

4.4 ONBOARD SUBSYSTEM AND ELECTRONIC SIGNS

4.4.1 Onboard CITS Processor

The Onboard CITS Processor shall meet the following criteria:

- Based upon a microprocessor, which is commonly used, widely available, technologically current, and suitable for mobile applications.
- Of sufficient capacity to support the full set of functions of CITS plus 50% additional capacity for future use without degradation of performance.
- Hard drive storage capacity shall be large enough to store two AVA databases, and two route and schedule databases plus an additional 25% to allow for future growth.
- Field-expandable to at least four times the memory capacity required. Memory expansion shall be accomplished by addition of cards or expanding modules capacity.
- Of sufficient durability to withstand and continue normal operation in the rigorous environment of the vehicle, including dust, water, and severe vibration.
- Option: Housed in an enclosure that is separate from the Mobile Data Terminal and installed in an equipment compartment.

The Contractor shall furnish the complete software, instructions, test procedures, tools, and data to re-load the onboard CITS Processor.

The software for the Onboard CITS Processor shall be self-diagnostic and shall include self-restarting of processes. The stability of this software shall be enforced through rigorous testing at all stages of development, as per IEEE software quality assurance requirements.

The Onboard CITS Processor shall provide for multi-protocol communications with all onboard CITS devices, and external devices including the headsign, PA system, speaker, ramp, door sensors, odometer, vehicle health systems (option), engine controller (option), SAS switch (option), and ramp (option). The Onboard CITS Processor shall handle each request for information on each physical data line and port, address the functional component that has the information stored, and provide the information to the requesting functional component in the appropriate format.

The Onboard processor shall have sufficient ports for each interface so as not to cause conflicts in port access.

The Onboard CITS Processor shall store all data, including the route and schedule database, required for the onboard subsystem that is not stored in any of the other components.

The Onboard CITS Processor shall maintain and provide precise timing to all in-vehicle components, utilizing GPS time as the synchronization reference.

The Onboard CITS Processor shall collect data from other elements, determine the status of the bus and shall control the transmittal of this information to the CITS backend via cellular data modem and spread spectrum radio.

The Onboard CITS Processor shall respond to queries for information from the Dispatch Center via cellular data network and wireless data network.

The Contractor shall furnish a mechanism for loading software updates into all vehicles in a managed process within a three-hour period via the wireless data network located at the Facility.

4.4.2 Mobile Data Terminal (MDT)

The MDT shall have a color touchscreen. The MDT shall support all messaging control functions.

The MDT shall have the capability for the driver to adjust the display brightness.

The software for the MDT shall be self-diagnostic and shall include self-restarting of processes. The stability of this software shall be enforced through rigorous testing at all stages of development, as per IEEE software quality assurance requirements.

The Contractor shall furnish the complete software, instructions, test procedures, tools, and data to re-load the MDT.

The MDT shall provide digitized keys for driver entry of alphanumeric data, commands, and control functions.

The MDT shall be ruggedly constructed and suitably reinforced for rigidity.

The mounting hardware shall be mounted in a location approved by Citilink.

The wiring harness for the MDT shall be labeled, and properly and securely positioned.

The mounting of the MDT shall allow for removal and replacement of the entire unit within 10 minutes.

4.4.3 Speakers

The Contractor shall interface to the existing internal and external speakers (option) for audio announcements by CITS.

4.4.4 Option: Silent Alarm Switch

The Contractor shall install an SAS pushbutton switch. The pushbutton shall be shrouded to avoid accidental activation, shall be at least ½" in diameter, and shall be electrically monitored by CITS such that its disconnection or failure shall be detected and reported.

4.4.5 Wireless Data Devices

The Onboard CITS Processor shall interface to the existing Cradlepoint router, provided by Citilink for wireless data communications.

4.4.6 GPS Receiver

The Onboard CITS subsystem shall interface to the existing Cradlepoint router, provided by Citilink for GPS functionality.

The Onboard CITS subsystem shall utilize GPS as the time source for the all Onboard CITS components including the CITS processor, mobile data terminal display, AVA display, and time-tags for all recorded events.

4.4.7 LED Sign Interface

The Onboard CITS subsystem shall interface with the existing internal LED message signs (Adaptive Micro Sys TDR80x7-.3A), provided by Citilink for visual messages.

4.4.8 Headsign Interface

The Onboard CITS subsystem shall provide the data in the format necessary to control the headsign, enable a manual override, and shall not interfere with the function of the destination equipment.

The Contractor shall provide separate software drivers for each type of headsign installed on the Citilink fleet.

When Onboard CITS equipment such as the Onboard Processor is replaced, the correct headsign drivers shall be activated or loaded for the headsign on the bus. Prompts shall be provided at the user configuration interface for selection of the correct headsign type.

4.4.9 PA Equipment Interface

The Onboard CITS subsystem shall be interfaced to the existing PA equipment, provided by Citilink to play internal audio announcements on the existing interior speakers.

Option: The Onboard CITS subsystem shall interface to the existing external speakers to play external audio announcements.

4.4.10 Onboard Electrical Requirements

The Onboard CITS bus equipment shall be designed to utilize the 12 or 24 -volt direct current power that is available in the equipment compartment.

All Onboard CITS equipment shall be protected against damage, loss, modification of data or software error caused by:

- Lower or higher voltage in the range of zero (0) to fifty (50).
- Reverse polarity of the input voltage.
- Transient voltage variations associated with starting of buses or operation of bus equipment and accessories.
- Vibration.
- Condensation.

The Onboard CITS Subsystem shall have protection from accidental voltage reversal.

The Onboard CITS Subsystem shall include protection to avoid damage if the subsystem were to be incorrectly installed.

The Onboard CITS subsystem shall have full functionality during starter motor operation.

Software strategies for energy conservation by the Onboard CITS Subsystem shall be utilized. The Onboard CITS equipment shall have the ability to enter a “sleep” or idle mode at X minutes after ignition shut off. X shall be a system settable parameter.

The Onboard CITS equipment power supply shall include adequate filters and components to regulate the voltage supplied by the bus and render it devoid of power spikes and noise that could cause the onboard CITS equipment to function improperly.

Sensing shall be incorporated within equipment power supply(ies) to cause the Onboard CITS equipment to be switched off or transferred to internal battery support if the supply voltage increases or decreases to levels beyond the voltage tolerance supplied and can result in erroneous operations and/or corruption of data.

The Onboard CITS subsystem shall not suffer from a sudden loss or reinstatement of power.

The Onboard CITS equipment shall operate and be unaffected by interference such as radiation from bus equipment, including radio, engine starter, lights, farebox, electronic destination signs, heaters, air conditioners, and generators.

The Onboard CITS equipment shall not emit measurable EMI or RFI, except that required for radio or cellular communication that produces harmful interference with any other onboard electronic devices or portable/mobile voice communication devices, fire protection systems, or other equipment outside the bus. The Contractor shall be responsible for demonstrating RFI and EMI compliance to an accepted standard such as ISO/IEC and IEEE.

The Onboard CITS Equipment shall not be affected by the electromagnetic fields generated by traction power (catenary or third rail) from heavy and light rail that is 20 feet away or by local high voltage power distribution lines that are 50 feet away.

The Onboard CITS Equipment shall be properly grounded and protected from high voltage (1000V) spikes from lightning.

4.4.11 Environmental Requirements

The Onboard CITS subsystem shall be designed, built, and installed to withstand the harsh operating environment in which the Onboard CITS equipment is to operate.

The Onboard CITS Subsystem shall meet operational requirements while exposed to temperatures from 0 to 130 degrees F and withstand -20 to 160 degrees F while not operational.

The Onboard CITS Subsystem shall meet operational requirements during thermal shock 1° per minute drop in temperature over 15°F range between 130° and 45°.

The Onboard CITS Subsystem shall withstand exposure to dirt, water, oil, and cleaning solvents conforming to IEC IP-54.

The Onboard CITS Subsystem shall withstand relative humidity from 13% to 100% RH including condensation (CITS subsystem components do not need to function when wet but must function properly under humidity conditions experienced inside Citilink vehicles).

The Onboard CITS Subsystem shall withstand vibration of 2g RMS and shock of 20g and conform to SAE J1455 4.9.4.1, 4.9.4.2, 4.10.3.1, and 4.10.3.4.

The Onboard CITS subsystem shall be available at the instant of engine start and remain operational throughout the time it takes the air conditioning and/or heating systems bring the vehicle to normal ambient conditions.

Any equipment installed by the Contractor on the exterior of the bus (including antennas and cable runs under the floor) shall be thoroughly sealed in a manner approved by Citilink to prevent leakage of rain or bus washing water, detergent and solvents into the bus, and protection from road debris throughout the life of the equipment.

4.4.12 Onboard CITS Subsystem Equipment Installation

The Contractor shall supply all materials and perform all work required for the proper installation of all associated Onboard CITS equipment in Citilink vehicles using installation drawings that have been prepared and submitted to and approved by Citilink.

The Contractor shall provide detailed installation plans and drawings by vehicle model for Citilink approval no less than 30 days prior to installation of the onboard CITS equipment. An Installation Functional Test Plan shall be submitted by the Contractor at the Final Design Review. No installation shall take place without approval of these plans by Citilink.

The installation plans shall include location of drilled holes, power feeds, and final location of all equipment, including final location of the MDT in relation to the driver's position. All wiring, harnesses and cabling shall be clearly identified in illustrations and schematics as to routing and location in the bus.

The Contractor shall make itself aware of all applicable Citilink, local, and State of Indiana safety regulations, procedures, and requirements.

The Contractor shall adhere to the regulations, procedures, and requirements at all times while present on the City of Fort Wayne property or in Citilink vehicles or facilities.

All work shall be done in a competent and expeditious manner, using industry standard practices and procedures.

All removed equipment from each vehicle shall be labeled with vehicle numbers and unit numbers, boxed in containers, and provided to Citilink, at a Citilink designated facility for storage and disposal. The Contractor shall use care in removing equipment in order to maintain the intrinsic value for later sale or disposal and shall not damage the vehicle. The Contractor shall be held accountable for any damage incurred.

Citilink's bus operations, access to current onboard equipment and wireless networks shall not be affected before or after the completion of CITS.

One prototype installation of all Onboard CITS equipment shall be made on each Citilink vehicle type. The prototype installation shall be made a minimum of two weeks prior to any other installation work. Citilink shall have the right to inspect and approve this installation before any other installation work is performed.

All hardware shall have the proper software loaded and shall be tested prior to the installation.

All installation & removal work shall be scheduled through the Citilink Project Manager.

All installation work shall be performed at Citilink's maintenance area unless otherwise approved by Citilink. If installation work is to take place off-site, Contractor shall provide the installation site and shall reimburse Citilink for the cost of transporting vehicles to the site.

Citilink will want to limit the number of new drilled holes on their vehicles. Therefore, all existing drilled holes shall be reused for new hardware, wiring, grommets, etc., to the greatest extent possible. Any holes in the exterior shall be properly sealed.

In the event, that installation of any CITS equipment requires modification or replacement of existing bus equipment (including, but not limited to, handrails, power supplies, mounting brackets, etc.), the Contractor shall be fully responsible to provide and install such replaced or modified equipment at no additional cost to Citilink.

If panels need to be removed for the CITS installations, the panels shall be reinstalled so no damage is done and the work shall be undetectable.

Cables shall be removed intact where possible and severed only when necessary.

All terminals shall be maintained, wherever possible, on removed wiring assemblies.

All wiring in buses shall be properly grounded and protected from chafing and installed in the plenum (air handling) spaces, except as approved by Citilink. Cabling used for CITS shall be appropriately rated for the plenum installation.

Exposed wire bundles inside the vehicle shall be properly run, securely anchored, and carried in loom, plastic sleeving, or tightly laced. All wiring exposed within the passenger compartment of any bus shall be armored, isolated, and protected when going through drilled holes, through bulkheads, and within brackets.

All cable assemblies shall be secured to minimize failure due to vibration and chafing.

If there is no framed undercarriage for the Citilink low floor buses, wire looms that are routed under the vehicle chassis shall go through frame rails and bulkheads. Any undercarriage wiring shall be suitably protected against the road elements and fastened in a manner so as not to sag or interfere with normal bus operation and/or maintenance.

Grommeting shall be used in all holes used by the Contractor to minimize cable damage due to chafing or vibration. Therefore, all drilled holes through frame rails/bulkheads shall be protected with silicone grommets.

The following are prohibited:

- PVC jacketed cables shall be utilized within the bus.
- Cable "stubouts"
- Scotch locks (or the like)
- Butt connectors
- Intermingling of power and signal cables in cable runs
- Exposed wiring

If butt splices are used, they need to be a quality heat shrink style.

All wiring, harnesses, looms, connectors, etc. shall be labeled as to device, component or function from its origin to its terminus. All new wiring and cabling shall be properly and permanently labeled every 24 inches as to the origin of the wire. This shall also be identified as the same nomenclature on the wire schematics.

Wire bands shall be installed every 24 inches to safely and securely hold wire looms in place.

All screws shall be of an appropriate length and installed so they do not contact other wires.

The Contractor shall install or verify previously installed DC wiring to ensure integrity, fusing and current capacity for the installation.

All DC wiring shall be direct from the battery distribution block and shall include both A+ and A- cables. Further, both A+ and A- cables shall be adequately fused at both the battery end and the CITS end with replaceable fuses.

Citilink shall have the right to inspect all installations for quality and workmanship, notwithstanding that such inspection or failure to conduct such inspection shall not relieve the Contractor of any responsibilities.

The Contractor shall maintain a log of installation events in hard copy and in an electronic form. The log shall include a record of the installation locations and photograph for each unit. The log shall be maintained in chronological order (date & time). The electronic copy shall remain readable by equipment and software programs furnished as part of this project. The log shall include but not be limited to the following: bus number in which the onboard equipment was installed, equipment model and serial number, date, software version (if applicable), and installing technician or supervisor. The log shall be made available to authorized Citilink personnel or Citilink representative at any time and delivered to Citilink in hard copy and electronic form when the mobile installation work is complete.

A complete functional test shall be made of each installed component and the integrated onboard system meets the requirements before releasing the vehicle to service.

The Contractor shall remove onboard equipment that will be replaced in order to accommodate the CITS Onboard subsystem. All removed items shall be retained for Citilink or disposed of per Citilink's directions.

CITS shall be placed into service utilizing a careful, controlled cutover procedure so as not to affect Citilink's operations.

4.4.13 Electronic Signs at Central Station

The LED signs shall be two-sided two-line signs. The characters to be displayed shall, at minimum, include the entire 128 ASCII character set. Each line shall be 4 inches or larger in height. The LED signs shall, at a minimum, be capable of displaying a minimum of 20 characters per line and scrolling capability. Proposers shall provide the dimensions of their proposed sign.

Monochromatic LED signs shall be used. Citilink prefers the use of amber colored LEDs. Proposers shall provide information on the brightness of the LED sign.

LED signs, backup battery and associated cables shall be protected by a secure enclosure to prevent vandalism, graffiti and solar degradation. The enclosure shall be weather and dust resistant. All connectors shall be disguised and protected to minimize the possibility of damage.

All mounting hardware shall be aluminum, stainless steel, and/or a galvanized material. No plastics or other materials will be acceptable. The brackets shall be powder coated to the matching color of the Central Station and the color shall not be affected by sun, extreme cold or heat. The powder-coating shall have a minimum warranty of five years without any material degradation. The Contractor shall submit all details of the sign enclosures and all mounting materials to Citilink for approval prior to installation.

4.4.13.1 Power

The LED signs shall be AC powered and be equipped. The LED sign display shall be on continuously, and not require a trigger to activate the display. The battery shall be a sealed unit, non-serviceable battery and shall have a minimum life cycle of five years. Proposers shall provide details of the battery including the power draw of the LED sign and cellular modem, the backup battery charging system, and the capacity of the battery backup.

Option: The signs shall have a battery backup. The battery backup shall be sufficient to allow for 1 hour of continuous operation of the sign without AC power.

4.4.13.2 Installation

The Contractor shall provide installation drawings<CDRL>, provide the materials necessary for the installation, obtain the necessary permits, and install all LED signs and associated hardware. The Contractor shall mount the LED signs on a Contractor provided pole. For pole mounted signs, the Contractor shall insure there are no glare issues and the sign displays can be visible under different lighting conditions and locations of the sun.

The Contractor shall demonstrate that the sign equipment functions properly prior to proceeding with full system deployment. The Contractor shall conduct tests that verify proper installation and interfacing of the LED signs and associated equipment. These tests shall include, but not necessarily be limited to:

- Visual inspection of all LED sign components for damage and conformance with specifications
- Verification that the LED sign components function as required by the specifications
- If necessary, determination of additional steps is required so the LED signs conform to the specifications

The Contractor shall submit an LED Sign Test Plan to verify correct operation of the LED signs.

4.4.13.3 Environmental Requirements

The electronic display signs shall be certified to function in an outdoor environment and shall not be affected by the following environmental conditions:

- Min. to max. temperature: -25 °F to 120°F for outdoor displays
- Relative humidity: 15% to 95%, non-condensing for outdoor displays
- Rainfall: up to 6 inches per hour
- Freezing precipitation: up to 3 inches per hour
- Wind speed: up to 100 mph, any direction

- Sunlight: None to full, direct
- Atmospheric pollutants: Characteristic of the Fort Wayne area, including salt, dust and corrosive or base chemicals.

The required wind load for signs on poles and shelters shall be 100 miles/hr., or the higher of wind load standards currently adopted by the American Society of Civil Engineers (ASCE), International Building Code (IBC), International Sign Association (ISA), and other national authoritative agencies, such as FHWA, TRB, etc.

The Contractor shall provide fans, heat sinks, heaters and other devices necessary to control internal temperature and humidity conditions in order to maintain proper operation of the displays. Provisions shall be installed to maintain an internal operating temperature range between the minimum and maximum operating environment temperatures of internal components, as specified by the display manufacturers and as necessary to ensure display reliability. Solar load and heat generated by internal components shall be added to the operating environment.

Equipment enclosures shall be designed and constructed to prevent the entry of water when the door is closed during a heavy rainstorm, under maximum rainfall and maximum sustained wind speed as defined above and as well as from pressure washing. Any water that does enter the equipment shall be routed out of the equipment and shall not cause short circuits, failures, or other damage. Sufficient filtration shall be provided to minimize the intrusion of dust, including brake dust (metallic particles) resulting from the operation of vehicles at a close proximity, through slots and other openings. Any dust that does enter the displays shall not affect its operation.

All exposed surfaces of the system components shall be unaffected by brushes, detergents, and cleaning solvents normally use by maintenance crews. All exposed surfaces shall also be resistant to ultraviolet radiation and air contaminants.

4.5 DELIVERY

Citilink shall be notified in writing at least two weeks in advance of each proposed delivery date of CITS equipment.

The CITS equipment shall be delivered to Citilink in heavy-duty boxes that are properly labeled, including manufacturer, equipment type, serial number, and date. Citilink will not be held responsible for any damaged components, missing or incomplete shipments.

Each CITS shipment sent to Citilink shall be accompanied by an inventory list showing the quantities, serial numbers, and brief description of all devices.

The CITS equipment shall be delivered to a location inside the Facility that is designated by Citilink.

5 PROJECT MANAGEMENT REQUIREMENTS

The scope, duration and size of this project requires the Contractor to create an effective Project Management team to ensure the success of the work. Therefore, all key project team members shall remain on the project until completion of the project.

5.1 PROJECT MANAGEMENT PERSONNEL

5.1.1 Project Manager

The Contractor shall establish a Project Manager, who shall be highly responsive to the needs of CITS as required in these Specifications and subject to Citilink acceptance. The Project Manager shall coordinate design and engineering activities and provide a technical liaison to Citilink. This person shall be highly competent and fully qualified in all aspects of the CITS project.

The Project Manager shall be available for the project within 7 days of NTP.

The Project Manager shall have the contracting authority to bind the Contractor contractually.

The Project Manager shall act as the Contractor's representative for dispute resolution.

The Project Manager shall have the authority to assign and schedule Contractor personnel to perform all the Work required by this Agreement and shall be responsible for directing all subcontractors' designs and work.

The Project Manager shall provide a single point of contact for Citilink to resolve all issues related to this Contract. The Project Manager shall be responsible for directing all subcontractors' designs and work. The Project Manager shall conduct weekly project status meetings with Citilink staff and provide monthly project updates for Citilink's Board of Directors.

The Project Manager shall have at least two years of experience in the implementation and management of mobile ITS projects and have completed at least a similar project for a fleet of 30 vehicles or more. Citilink shall be the sole determinant of the suitability of the proposed Project Manager's qualifications. Citilink reserves the right to have the Project Manager replaced if these qualifications are not met.

The Project Manager shall be available to Citilink on a twenty-four hour per day, seven days per week basis via cell phone and shall respond promptly to any reasonable Citilink request. Alternate coverage of this requirement shall be subject to approval by Citilink.

The Project Manager shall be on site during all significant project events, as necessary to facilitate meetings, project activities, and information flow between the Contractor and Citilink, and as requested by Citilink. The Project Manager shall be on site during the installation and testing of CITS.

5.1.2 Senior Project Engineer (SPE)

The SPE shall be available to the Project within seven (7) days after NTP.

The SPE shall act as a technical resource for coordinating all system design and implementation issues.

The SPE shall check each technical submittal prior to its submission to Citilink for approval.

The SPE shall provide QA checks on the system designs, factory wiring and assembly work, and fieldwork.

The SPE shall be qualified to practice electrical engineering, or an engineer who qualifies as acceptable to Citilink. The SPE shall have a minimum of two years of experience in coordinating engineering and administrative support activities for computer aided dispatch projects for a bus fleet of 30 vehicles or more. Citilink shall be the sole determinant of the suitability of the proposed SPE's qualifications. Citilink reserves the right to have the SPE replaced if these qualifications are not met.

The SPE shall be on site during all significant project events, as necessary to facilitate meetings, project activities, and information flow between the Contractor and Citilink, and as requested by Citilink.

Coverage of the availability requirement by any alternates shall be subject to approval by Citilink.

5.2 PROJECT MEETINGS

The Contractor's Project Manager and SPE shall conduct weekly teleconference calls.

The Contractor's Project Manager and SPE shall attend Progress Meetings at Citilink as needed. Proposers shall state their planned onsite presence.

The Contractor's Project Manager and SPE shall conduct a Project Kickoff Meeting with CITS stakeholders and the CITS Consultant Manager. The Contractor's Project Manager and SPE shall attend additional meetings, as requested by Citilink.

All expenses for the establishment of video or conference calls shall be borne by the Contractor.

The Contractor shall prepare an agenda for each meeting and shall provide a draft agenda to Citilink at least one week prior to each meeting. Review of the previous meeting minutes and any outstanding action items shall be included on the agenda for each meeting. Each progress meeting agenda shall also include the item, "Additional Citilink Issues and Concerns." Citilink may add any additional items to the agenda.

The Contractor shall prepare minutes for each meeting. The Contractor shall prepare the minutes and distribute them to the attendees within two days after the meeting. Minutes of the meetings shall include names of attendees, significant proceedings, decisions, unresolved issues, and a list of information requested by Citilink. The minutes shall be of sufficient detail to record any decisions made at the meeting and any follow-up actions required. The minutes shall include a summary of open action items, the party responsible for each, scheduled date for the action, and the respective resolution.

5.3 SCHEDULE

The detailed contract schedule shall be a critical-path-method schedule constructed using Microsoft Project or other software application acceptable to Citilink. The detailed contract schedule shall show each activity, including interface activities, for completion of the Work, and shall be properly ordered and sequenced.

A detailed contract schedule shall be submitted for Citilink approval within 45 calendar days after NTP.

The detailed contract schedule shall be sufficiently detailed to preclude the use of activity durations greater than 20 working days. Activity durations shall include allowances for lost time and inefficiencies.

Each task designation shall delineate the phase or stage of the Work, and the component of the Work such as design, submittal, submittal review, procurement, fabrication, delivery, installation, and testing.

Where appropriate to the understanding of the task, additional details shall be provided, such as the following:

- A clear description of the activity, including its location
- The duration expressed in full working days
- A responsibility code denoting the Contractor, a subcontractor, or Citilink is performing the activity
- The quantity of material, in units
- The integer percent complete representing the installed progress
- The actual start and finish dates where applicable
- Unless specifically agreed to in writing by Citilink, Contractor is responsible for all Work to complete any task

The detailed contract schedule shall show a clear and definable critical path(s) for the Work and each specified milestone. Requirements and events which impose limitations, as well as dates and milestones which constrain the time, shall be clearly identified. Days of float time shall be shown. Items that require Citilink inputs and responses shall be clearly identified.

The detailed schedule shall be updated monthly to show actual progress and changes to projected dates. Each update shall include a narrative describing the changes made since the last update. Each update shall be provided to Citilink within 5 working days from the month-end cut-off date and submitted with each invoice.

5.3.1 Rolling Schedule

The four-week rolling schedule shall show one week of historical information and three weeks of planned activities that are consistent with the detailed contract schedule.

The four-week rolling schedule shall be presented as a chart with tasks along the left side and days along the top of the table. A shaded bar or "X" entered in the chart shall indicate the work to be performed on each day for that task.

The level of detail shown on the four-week rolling schedule shall be greater than the level shown on the detailed contract schedule. In general, it shall show the Work to be done each day and the location(s) where the work will be done and by whom. Work done in buses and other vehicles shall be uniquely identifiable or as part of an easily traceable group of buses. Work that requires a Citilink input or response shall be clearly identified.

The Contractor shall provide updates to the four-week rolling schedule on a weekly basis by the end of the first day of each active week in electronic format.

5.4 SUBMITTALS

The Contractor shall transmit submittals sufficiently in advance of Contract requirements to permit at least twenty-one (21) calendar days for review, checking and appropriate response by Citilink or designated representative.

The Contractor shall furnish the transmittal forms sequentially numbered and clearly indicate the Project Name; Project Number; Date; "To:"; "From:"; names of subcontractors, suppliers, or manufacturers; required Specification references; category and type of submittal; purpose; description; distribution record (for transmittals and submittals); and signature of transmitter.

The Contractor project manager and SPE shall examine and check the submittal for accuracy, completeness, and compliance with the Contract before delivery to Citilink.

The Contractor shall maintain a complete up-to-date, organized document management system of all past and current submittals including an index and locating system, which identifies the status of each submission. The Contractor shall provide 24/7 access to the record of submittals.

- Assign sequential numbers to each submittal.
- Assign revisions levels (A, B, C, etc.) to all resubmittals. Assign new transmittal numbers and cross references to previous submittals.

All submittals shall be provided in electronic format. File formats for electronic copies shall be subject to Citilink approval. Current version, industry-prevalent software shall be utilized for preparing all submittals. Drawings shall be submitted in AutoCAD and PDF formats. Drawings or studies involving geographic information shall be submitted in a format that is acceptable to Citilink.

Certain submittals designated by Citilink shall be submitted in hardcopy as well.

Option: The Contractor shall furnish to Citilink one fully licensed copy of AutoCAD or other industry prevalent software necessary for viewing and making mark ups to the submittal.

5.4.1 Citilink Review

Citilink and/or designated representative will review and approve or take other appropriate action upon the Contractor's submittals. Citilink's action shall not be taken so as to cause a delay in the Work or in the activities of the Contractor.

Citilink review of such submittals is not conducted for determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which shall remain the responsibility of the Contractor as required by the Contract.

All Contractor's submittals will be acknowledged by Citilink or designated representative with the date of receipt, and one of the following dispositions will be sent to the Contractor. The Contractor shall proceed as follows:

1. APPROVED: Work may proceed, provided it complies with the Contract. The approval of documents, drawings and samples shall not be construed as
 - Permitting any departure from the Contract requirements;

- Relieving the Contractor of responsibility for errors and omissions, including details, dimensions, and quantity of materials;
- Approving departures from details furnished by the Contracting Officer or designated representative.

2. APPROVED AS NOTED (Correct and resubmit): Work may proceed, provided:

- It complies with the Contract as well as the corrections on the submittals, and the Contractor resubmits within fifteen (15) days corrected copies of the design documentation, drawings, or miscellaneous submittals for final approval;
- Work performed by the Contractor prior to receiving final approval will be at the Contractor's risk.

3. DISAPPROVED (Revise and Resubmit): Work is not recognized as being able to proceed.

- The Contractor shall make corrections as required by Citilink or designated representative, and revise submittal in accordance with notations thereon, and resubmit immediately.
- The Contractor shall handle re-submittals in the same manner as first submittals, except designate them with suffix A, B, C, etc. to indicate first, second, or third resubmittals.
- On resubmittals, the Contractor shall direct specific attention in writing on resubmitted documents, drawings, samples, mock-ups, sample panels, or miscellaneous submittals to the revisions made other than the corrections required on previous submissions.
- The Contractor shall deliver the resubmittal to Citilink or designated representative within ten (10) business days of a Disapproved disposition.

The Contractor shall acknowledge receipt of disposition.

5.4.2 Drawings

The Contractor shall be responsible for the accuracy and correctness of all drawings. The Contractor's Project Manager and SPE shall review and initial each drawing, indicating that it complies with all requirements of this Specification and accurately reflects intended or actual conditions. Drawings that require a Professional Engineer's seal per Indiana State Law shall be sealed and signed by the Contractor's Professional Engineer before submittal.

The Contractor shall check each drawing for the following:

- Conformance with Contract Documents
- Logical grouping and arrangement
- Accuracy
- Legibility
- Neatness
- Line Quality

- Lettering Quality
- Reproduction Quality
- Completeness

The Contractor shall prepare design, working and shop drawings as necessary to perform the Work adequately. Each drawing shall be laid out in an organized manner such that it is easily understandable. The use of crossed lines in schematic or functional drawings shall be avoided, to the extent possible. Breaks and continuations in drawings shall be minimized. Mounting and installation drawings shall be accurately scaled, and the scale shall be clearly noted on the drawing. All symbols and abbreviations used shall be defined on each drawing, or if submitted as a book of drawings, on a master symbol sheet.

5.4.3 Product Data Submittals

The Contractor shall prepare a submittal for each major piece of material or equipment that the Contractor will furnish. These submittals shall be known as "Product Submittals". Electronic copies of each product submittal shall be furnished. Each submittal shall be accompanied by a cover letter with reference number, signed by the Project Manager. If applicable, the submittal shall contain a list of any parameters for which the submitted products do not meet the Specifications and a description of how these changes will affect system design. If applicable, the submittal shall contain a description of any changes in design or products that the submitted products will cause.

Each submittal shall contain sufficient information to confirm the system component complies with the Specifications and Agreement. Actual values of all specified parameters shall be listed; a simple statement that the product complies will not be sufficient. Each product submittal shall be accompanied by engineering drawings necessary to determine the product's applicability to CITS design(s). All closely related products shall be submitted as a single package. When pre-printed material is used in a submittal, the specific model number and options to be furnished shall be clearly identified.

Standard data sheets can be used, subject to the following:

- Manufacturer's standard and/or schematic drawings are modified to delete information, which is not applicable to the Contract. The Contractor shall supplement standard information with additional information applicable to this Contract.
- Manufacturer's standard diagrams, schedules, performance charts, illustrations, calculations, and other descriptive data are modified to delete information, which is not applicable to the Contract. The Contractor shall indicate dimensions, clearances, performance characteristics, capacities, and include other diagrams, as applicable.

5.4.4 Test Procedures

The Contractor shall submit an electronic copy of each test procedure description for approval by Citilink. The Contractor shall obtain approval of the test procedures from Citilink before commencing any official testing.

Each test procedure description shall include the following information:

- A statement of the purpose of the tests
- The location, date(s) and time(s) tests will be performed

- Staff required to perform the test
- The quantity of units to be tested
- The test equipment to be used, identified by manufacturer and model number
- A step-by-step description of the procedure to be performed
- Specific pass/fail criteria for each test
- A sample of the form(s) to be used to record test data

Each test form shall include the following information:

- Test title
- The manufacturer, model number and calibration date of each piece of test equipment
- A table to record individual readings taken and inspections performed for each unit tested, identified by the serial number of the unit tested
- An indication that the unit has passed or failed each individual test
- A line for signature of the technician performing the test and date
- A line for signature of the Project Manager and date
- A line for signature of Citilink representative witnessing the test
- Drawings illustrating the configuration of the equipment tested and all test equipment utilized

5.4.5 Test Results

The Contractor shall submit one original hardcopy and electronic copy of the test results. The original test result forms shall contain the original test forms filled out by the technicians performing the tests and original signatures. The test forms shall be filled out in ink and no erasures shall be made. Errors shall be crossed out with a single line and initialed by the person making the correction.

Each set of test results shall include the following information:

- The complete test procedures used.
- The completed, signed test forms.
- A summary of the test indicating quantity tested, quantity that failed, quantities that failed each individual procedure, and a statement of the remedy to be applied for failed units.

5.5 AS-BUILT DOCUMENTATION

As-built documentation shall include drawings and software documentation. As-built documentation shall include:

- Design and Installation Plans of the Onboard CITS subsystems for each bus and vehicle type.
- Design and Installation Plans of the CITS Computer subsystem components that are installed at the Citilink Facility.
- Design and Installation Plans of the Electronic Signs at Central Station.

5.5.1 As-Built Drawings

The Contractor shall provide As-built drawings for a permanent record of the finished system. Each design, working and shop drawing that was submitted for approval shall be modified to reflect the actual installed condition and shall become an as-built drawing. These drawings shall be supplemented with site-specific information.

If a drawing is typical for more than one location, the locations shall be explicitly listed on the drawing:

- All nomenclature and labels shall correspond to the actual labels on the installed equipment.
- Each connection to each piece of equipment, junction box, or terminal block shall be identified by function and color code.
- All dimensions, physical details, connections, and other information pertinent to system diagnostics, maintenance or troubleshooting shall be shown.
- All components shall list brand name, model name, part numbers, location of installation, and quantities of units per-vehicle.

The drawings furnished shall show details of all interconnections, including pin assignments, color codes, terminal designations, tag nomenclature, and their functions.

The drawings furnished shall show details of the equipment mounting and cable routing for each model of bus and vehicle. Keyed parts list for the mounting hardware shall be included.

If applicable, the drawings furnished shall show rack mounted equipment, routing of interconnection cables, routing of power and ground cables, and include a parts list for mounting hardware.

All drawings germane to a subject shall be submitted as a package with a cover sheet, index, and symbols and abbreviations table. A master index of as-built drawings that organizes the drawings by package and drawing number shall be provided.

The Contractor shall submit a pre-final version of the as-built drawings to Citilink prior to maintenance training and prior to acceptance testing.

The Contractor shall correct any inaccuracies and add plans to correct any deficiencies as identified by Citilink or as necessary to document changes made during acceptance testing.

Final versions of the as-built drawings shall be submitted within two weeks after acceptance testing has been completed or maintenance training, whichever is later.

The Contractor shall submit two copies of pre-final drawing packages in 11"x17" hardcopy format and also electronic copies in AutoCAD or Citilink accepted format, PDF format, and DXF format. Three copies of final as-built drawings shall be submitted in 11"x17" hardcopy format and also electronic copies in AutoCAD or Citilink accepted format, PDF format, and DXF format.

5.5.2 As Built Software Documentation

The Contractor shall provide all "Computer Software" and "Data" to allow Citilink to fully maintain and update all CITS software.

The Contractor shall submit electronic copies of each document in a format that is accessible by Citilink. The Contractor shall incorporate each document into Citilink's Electronic Document Library.

5.6 PROJECT CLOSEOUT

Project closeout shall include an initial survey and a final survey. Prior to requesting an initial closeout survey of CITS, the Contractor shall ensure the following conditions shall have been met:

- All installations have been completed and accepted by Citilink.
- All formal training sessions have been completed.
- All manuals have been submitted.
- The Contractor has listed those items yet to be completed or corrected and has submitted a detailed plan of action and schedule for completion of the outstanding items.
- The Contractor has submitted special guarantees, warranties, maintenance agreements, final certifications, and similar documents.
- The Contractor has obtained and submitted operating certificates, if required, final inspection and test certificates, and similar releases enabling full and unrestricted use of the Work.
- The Contractor has submitted all final as-built documentation.
- The Contractor has delivered tools, including special tools, test equipment, standby equipment, and related items.
- All acceptance tests have been conducted and accepted by Citilink.

Upon receipt of the request for initial survey from the Contractor, Citilink will prepare a list of any additional work items that are outstanding. The Contractor shall perform the Work necessary to complete and correct the items noted during the initial survey and by Citilink.

The Contractor shall provide written notice to Citilink when the items noted during the initial survey have been completed and CITS is ready for final survey. Upon receipt of the notice, Citilink will schedule a final survey to verify that all Work items have been completed satisfactorily.

5.7 SYSTEM DELIVERABLES

CITS deliverables provided by the Contractor shall include all Work required to deliver CITS, CITS subsystems, and components in accordance with this Specification and Agreement. This list is for the convenience of the proposers only and shall not be considered all-inclusive. All hardware delivered shall have a full life span when delivered to Citilink. All hardware and software shall be the newest versions available at the time of installation at Citilink. All software and hardware offered by the Contractor's proposal and/or BAFO that were not listed as an option shall be a deliverable.

5.7.1 Onboard CITS Subsystems

The Contractor shall provide (45) Onboard CITS subsystems that shall be installed in buses and successfully pass acceptance tests. Each Onboard CITS subsystem shall include an Onboard Processor, MDT, heads sign interface, PA interface, internal LED sign interface, SAS switch (option), mobile gateway router interface, and all associated hardware, software, and firmware.

The Contractor shall be responsible for supplying all necessary tools, fasteners and miscellaneous materials required for installation and configuration of the Onboard CITS subsystems.

The installation of the Onboard CITS components shall be accomplished per the Contractor provided and Citilink approved schedule.

The Contractor shall furnish spare Onboard CITS subsystems, sufficient to fully equip four Citilink buses with all elements on the Citilink buses as described in this Specification, including all connectors, cables, and mounting hardware.

The spare Onboard CITS subsystem equipment shall be functionally tested, calibrated, and frequency tested (if applicable) prior to shipment to Citilink, in accordance with the approved test plan and procedure. The test results shall be submitted to Citilink prior to scheduling delivery. A copy of the test results shall also accompany all spare components.

Option: The Contractor shall provide pricing for up to an additional (25) Onboard CITS subsystems.

5.7.2 CITS Computer Subsystem

The Contractor shall provide all hardware, software, and licenses necessary for the CITS CAD subsystem including virtualized servers, SAN, KVM switch and monitor, server monitoring software. The CITS CAD environment (including servers, SAN, backup equipment, and WAN interface) shall be delivered and installed at two hosted sites. Current versions of any software, fully patched, shall be deployed. The Contractor shall be responsible for supplying all necessary tools, fasteners and miscellaneous materials required for installation of the CITS equipment. The hosted sites shall include the appropriate UPS power backup.

5.7.3 CITS Dispatch Workstation Software

The Contractor shall provide and install all necessary software and licenses on two Citilink workstations to enable access to CITS for dispatching on two Citilink workstations, and one Citilink workstation for performing AVA Editor tasks.

If applicable, the Contractor shall be responsible for supplying all necessary tools, fasteners and miscellaneous materials required for installation of CITS dispatch equipment.

The CITS dispatch and AVA workstations shall be located in the Citilink facility as designated by Citilink.

The Contractor shall provide and install all necessary software to enable access to CITS on four stations designated by Citilink, to function as management workstations.

The installation of the software for the dispatch, AVA and management monitoring workstations shall be accomplished per the Contractor-provided and Citilink-approved schedule.

5.7.4 CITS Maintenance Workstation Software

The Contractor shall provide and install all necessary software and licenses on one Citilink workstation to enable access to CITS for the management of uploads and downloads of data to/from buses and enable maintenance staff to view vehicle locations and vehicle information for road calls and vehicle maintenance.

If applicable, the Contractor shall be responsible for supplying all necessary tools, fasteners and miscellaneous materials required for installation and configuration of the Maintenance Workstation.

The installation of the software on the maintenance workstation shall be accomplished per the Contractor-provided and Citilink-approved schedule.

5.7.5 Electronic Signs at Central Station

The Contractor shall provide and install eighteen (18) electronic signs at the Central Station. The Contractor shall be responsible for supplying all necessary brackets, cables, tools, fasteners and miscellaneous materials required for installation of the electronic signs. The installation of the electronic signs shall be accomplished per the Contractor-provided and Citilink-approved schedule.

5.7.6 CITS Software and Database

The Contractor shall provide and install all software and databases for CITS. Installation and testing of software and databases shall not disrupt Citilink bus operations. The installation of the CITS software and databases shall be accomplished per the Contractor provided and Citilink-approved schedule.

5.7.7 Diagnostic and Test Equipment

The Contractor shall provide all necessary equipment for diagnostic testing of the Onboard CITS subsystem and any components of the Computer Aided Dispatch subsystem that are installed at Citilink. The Contractor shall provide one Mobile Test set and one mobile programming laptop.

The Contractor shall furnish a complete mobile test set that is similar to a BIB (bus in a box). The mobile test set shall include a fully functioning set of mobile equipment with a power supply mounted on a cart. The Onboard CITS subsystem components shall be mounted on shelves such that each component shall be easily removable so that units under test can be quickly substituted and functional checks performed. All connectors shall be clearly and permanently labeled. The test set shall also be used for training purposes.

The Contractor shall provide a ruggedized laptop computer with licensed software, licenses, interfaces, and connector cables as necessary for programming and optioning of all mobile equipment for the buses and supervisor vehicles, and for database downloads. The laptop shall use the most current commercial technologies for the processor, RAM and hard drive memory, video and audio cards, USB, and Ethernet ports, subject to approval by Citilink.

The programming and optioning software shall be conveniently organized so that technicians can rapidly and efficiently set up a complete Onboard CITS Subsystem, or any additional component as needed.

5.7.8 Manuals, Training, and Training Tools

The Contractor shall provide manuals as listed in Table 6-1, training classes as listed in Table 7-1, and training tools including one "Bus in a Box" (BIB) simulator (option), and training/testing units to enable Citilink staff to properly operate, maintained, and repair CITS.

Option: At a minimum, the "Bus in a Box" shall contain a cellular data modem or router, Onboard Processor, and MDT.

Delivery of the manuals, training, and training tools shall be accomplished per the Contractor-provided and Citilink-approved schedule.

5.7.9 Design Submittals

The Contractor shall provide preliminary and final design submittal packages and associated design review, as well as individual design details for all elements specified herein. The Contractor shall provide detailed installation/cutover plans and procedures. All submittals shall be in both hardcopy and electronic format.

5.7.10 As Built Documentation

The Contractor shall provide As Built Documentation as described in this Specifications. Delivery of the As Built Documentation shall be accomplished per the Contractor-provided and Citilink approved schedule. All as-built documentation shall be provided in both hardcopy and in electronic format.

5.7.11 Monthly Status Reports

The Contractor shall submit Monthly status reports to Citilink on the 10th of each month detailing the previous month's progress. The monthly status report shall contain a description of the activities and accomplishments, plans for the following month, an updated schedule showing the progress, and any issues or concerns. The Monthly status report format shall be submitted to Citilink for approval.

5.7.12 Test Plans/Procedures and Test Results

The Contractor shall provide all Test Plans/Procedures required for the CITS project and the Test Results. The Test Plans/Procedures and Test Results format shall be submitted to Citilink for approval.

5.7.13 Closeout Documentation

The Contractor shall provide closeout documentation as described in these Specifications.

5.8 SYSTEM SUPPORT

5.8.1 Support Prior to System Acceptance

Prior to System Acceptance, the Contractor shall provide support for the maintenance and operation of installed CITS subsystems and components twenty-four hours per day, seven days per week. It is Citilink's intent to begin operating CITS after completion of the first incremental acceptance.

The Contractor shall provide full support to Citilink to repair CITS equipment and assist with data management and report generation.

The Contractor shall provide on-site support on a continuous basis at Citilink during testing and cutover of CITS equipment.

The Contractor shall answer requests by Citilink for assistance within thirty minutes of a text or email or call from Citilink. The Contractor shall provide on-site support within four hours when requested by Citilink.

5.8.2 Warranty

The Contractor shall provide continuous support for the management and maintenance of the CITS Computer Subsystem located at the hosted site. Support tasks include automatic switching to hot standby servers, reverting back to the primary servers, generation and distribution of performance reports, backups of data, and phone support.

The Contractor shall provide to Citilink a full warranty for on-site maintenance/operation hardware and software support and software maintenance/ upgrades for CITS for one year after System Acceptance and shall cover all parts, labor, and shipping costs.

The warranty shall cover installed components and shall include but not be limited to:

- Wiring

- Wiring fasteners, connectors
- Fasteners / Hardware
- Brackets and related hold down materials
- Grommets
- Screws, bolts, washers, nuts, terminals
- Knobs
- Switches
- Controllers

Wiring installed by the Contractor shall be warranted from chaffing, cutting, or becoming compromised for five full years from date of acceptance of installation for each vehicle--accidents, negligence or no fault of the Contractor notwithstanding.

Citilink intends to support CITS with Citilink personnel, but the Contractor shall be available for additional support for issues that are beyond the skill sets developed by the Contractor for maintenance of CITS by Citilink personnel. The additional support shall be mainly telephone support but may require occasional on-site support as determined by Citilink in consultation with the Contractor. The Contractor shall provide telephone support 24 hours a day and 365 days a year. The Contractor shall provide telephone support and/or remote access when requested by Citilink within one hour and onsite response time when requested by Citilink within 8 hours for critical and major issues.

Defective equipment shall be repaired and returned to Citilink within 10 business days.

The Contractor shall provide prepaid shipping of RMA parts and advance return units shipped to Citilink. The Contractor shall provide an itemized documentation of the repairs that were done for each RMA.

On at least a quarterly basis, the Contractor shall provide a list of security patches for the operating systems and provide software updates that shall be installed by the Contractor but could also be installed by Citilink. The Contractor shall provide technical release notes prior to updates.

Option: The Contractor shall provide pricing for additional warranty support for years 2, 3, 4, and 5, or a not to exceed % increase over those same years.

5.9 QUALITY ASSURANCE

The Contractor shall submit to Citilink within 30 days of the Notice-To-Proceed (NTP) a comprehensive QA Program Plan designed to ensure the quality of all activities, including design, purchasing, inspection, handling, assembly, fabrication, testing, storage, shipping, and warranty/repair work. The plan shall describe all quality control procedures of the Contractor and any sub-suppliers.

The Contractor's Project Manager shall establish a quality assurance process to verify that the following occurs:

- Prior to installation, all system components delivered by the Contractor shall pass rigorous screening that complies with standards of practice.

- All delivered system components shall be tested after installation. Testing shall include hardware and software interface tests.

The Contractor shall utilize products manufactured by companies that utilize formal, documented quality assurance practices that meet or exceed the standard of care established by the industry. The Contractor shall proactively monitor each supplier's quality system. Quality systems that conform to ISO 9000 practices are preferred. The Contractor shall only use "custom" components when standard components are unavailable to meet the CITS requirements.

The Contractor shall not commence any fabrication, assembly, software coding, and procurement of components until the Quality Assurance and Control Plan relating to such Work has been accepted by Citilink.

The Contractor shall conduct regular inspections in accordance with guidelines defined by the QA Program Plan. The Contractor shall update the QA Program Plan as necessary when any deficiencies in the Work are discovered.

Citilink will, at its own discretion, perform QA monitoring of work done under this Contract, including monitoring of the Contractor's or Subcontractor's QA activities. Upon request, the Contractor's QA records shall be made available to Citilink for inspection. Such QA activities performed (or not performed) by Citilink shall not reduce nor alter the Contractor's QA responsibilities or its obligation to meet the requirements of this document.

At any time during the manufacturing process, Citilink may choose to visit the Contractor's facility or a Subcontractor's facility during normal working hours to audit the manufacturing and quality control processes.

5.9.1 Technical Documents

A key component of the CITS implementation is the accuracy and value of all deliverables. The technical documents prepared by the Contractor during this project shall include design reports, installation drawings, test plans, test reports, progress reports, software documentation, and other technical memos. A review process shall be established by the Contractor to assure all subsystems and components are checked for accuracy, correctness, uniformity, and compliance with standards of practice.

The Contractor's Project Manager shall review project products for adherence to the standards of care common to the profession.

The Contractor's Project Manager shall be responsible for assigning qualified professionals to check all work products for accuracy, uniformity, and clarity. Responsibility for interface, control, and integration of disciplines into a uniform and coordinated document set is also included in this role.

The Senior Project Engineer and individuals assigned as technical discipline leaders within the Contractor team shall provide another review. The reviews shall be initiated by the Project Manager and shall focus on a technical discipline review of selected project products. Citilink review of the documents will occur only after the Contractor's internal review cycles have been completed.

When review comments result in a change to any technical document, the Contractor's Project Manager shall be responsible for change coordination and document back-check.

In addition to the formal and on-going quality control review, timely coordination meetings with all project staff shall be held to provide for interdisciplinary liaison and interface coordination. These meetings shall be utilized to schedule work assignments, identify, and resolve coordination issues, and track progress associated with any problems encountered and their resolution.

5.9.2 Document Management

Due to the substantial amount of documentation involved in this project, the Contractor shall develop and submit to Citilink a Documentation Management System (DMS). The DMS shall include an organized electronic library of all versions of all submittals and a log of the contents. This shall be completed within 30 days after Notice to Proceed.

Citilink and the Contractor shall mutually agree on a documentation file index that provides an overall methodology for referencing documents generated during the project. File type and organization of electronic versions of documentation shall be mutually agreed on by Citilink and Contractor. All subsequent documentation shall be referenced to the file index, and Contractor and Citilink shall mutually maintain the file index in current condition to show all documents that have been generated and their status.

Documentation in the DMS shall be readily available to Citilink's Project Manager and CITS project stakeholders.

Security methods, including password protection, shall be employed to restrict access to the DMS.

6 MANUALS

The Contractor shall provide the following quantity of manuals to provide the documentation needed by Citilink staff to manage and maintain CITS and to support training activities. Electronic copies shall also be provided.

Table 6-1 Manual Quantities

QTY	Manual User
90	Drivers
5	Dispatchers
5	Onboard Equipment Maintenance Staff
5	System and Data Administrators

6.1 GENERAL REQUIREMENTS FOR MANUALS

The manuals shall contain all the informational material required to support the area of activity and include all information to be covered during the associated user training classes.

The Contractor shall submit for approval the outline of each manual as a part of the Preliminary Design Review.

The Contractor shall develop and submit a draft version of each manual submitted with the Final Design Review.

The Contractor shall deliver completed manuals 21 days prior to the start of the training.

At the conclusion of the warranty period, the Contractor shall provide final versions of the manuals that incorporate information gathered during the installation, acceptance tests, and warranty period.

All manuals shall conform to the following:

- Concise with minimal redundancy.
- Organized in clear, logical fashion, and indexed and tabbed for rapid access.
- Written for comprehension by the intended Citilink reader.
- Table of definitions for all abbreviations, acronyms, and special terms.
- Delivered electronically in MS Word, Portable Document File, or other Citilink approved format.

6.2 DRIVER MANUAL

The Driver Manual shall provide a clear and concise description of CITS, the Onboard CITS subsystem and the driver interface with CITS. The following are suggested topics for the Driver Manual:

- CITS Overview
- Onboard CITS subsystem description
- Definition of all MDT display symbols and labels
- Procedure for adjusting MDT brightness
- Procedure for adjusting the MDT's adjustable arm (if applicable)
- How to perform all communications and bus fleet management functions provided at the MDT
- Procedures for sending canned messages, and receiving and responding to text messages
- Procedures for playing general service announcements and adjusting volume levels
- Procedures for logon/logoff via MDT
- Procedures for navigation of the MDT screens
- Description of all alarms and messages, and procedures for remedial action for each alarm and message
- Help guide for the most common failures and explanation of error codes and error messages
- Reference card with instructions on key features and functions that is pocket size when folded
- Option: Procedures for SAS
- Option: Procedures for completing the pre-trip inspection
- Option: Procedures for entering wheelchair and bike rack information in the MDT

6.3 DISPATCHER MANUAL

The Dispatcher Manual shall provide a clear and concise description of the CITS and the CITS dispatch workstation functions and features for Citilink staff performing dispatch duties, maintenance staff supporting road calls, and staff performing data uploads and downloads via the wireless network. The following are suggested topics for the Dispatcher Manual:

- CITS overview
- Dispatch graphical and tabular display descriptions
- Definition of all display symbols and labels
- Easy to understand functional flowcharts for commonly used features
- How to navigate from one function to another
- How to perform all data communications and bus fleet management functions using the dispatch workstation
- Procedures for remotely logging on a driver

- Instructions on viewing vehicle locations on the map display
- Instruction on viewing vehicle status
- Instructions for creating detours and saving them
- Instructions for managing Add Bus Service and missed trips
- Procedures for the generation of fleet management reports
- Instructions for the Operations Manager to assign work assignments
- Instructions for maintenance staff to perform all maintenance related CITS functions
- Instructions for Citilink staff to manage and monitor uploads and downloads via the Citilink wireless network
- Instructions for users to perform fleet management functions provided by the Maintenance Workstation
- How to perform rudimentary remedial action for limited-scope failures, including: shutting down and restarting the workstation and workstation-based software processes
- Help guide for the most common failures
- Explanation of all alarms and messages, and the recommended remedial action for each alarm and message
- Option: Procedures for sending messages for display on the onboard LED signs at stops and making announcements on the PA system
- Option: Procedures for SAS management

6.4 ONBOARD CITS SUBSYSTEM MAINTENANCE MANUAL

The Onboard CITS Subsystem Maintenance manual shall provide a clear and concise description of CITS, and the Onboard CITS Subsystem for Citilink maintenance staff maintaining the vehicles.

The following are suggested topics for the Maintenance Manual:

- CITS Overview
- Functional description of the Onboard CITS Subsystem
- Physical layout of the CITS components
- Installation drawings and diagrams showing the wiring between Onboard CITS components and all applicable onboard systems such as the PA system, speakers, LED sign, headsign, and electrical systems
- Photos of the installed CITS components
- Easily read functional flowcharts for diagnosis of the most common equipment failures
- Identification of the source of a problem to a specific replaceable element--provide logical procedures for isolating a problem.
- Description of self-diagnostic features

- Explanation of error codes and error messages
- Description of test equipment and tools necessary to troubleshoot and maintain CITS components
- Configuration of the CITS components
- Discussion on recommended intervals for preventive maintenance of CITS components
- Procedures for preventive maintenance of the CITS components
- Instructions on the replacement/repair of a component: detailed procedures for the installation, instructions for the configuration and setting of options, and verification of proper operation
- Instructions on safety procedures and precautions necessary to prevent damage to equipment, injury to personnel, and unsafe operational conditions

The Onboard CITS Subsystem Maintenance manual shall have page protection covers enclosing each page suitable for use in a transit maintenance facility.

6.5 CITS SYSTEM ADMINISTRATOR MANUAL

The CITS System and Administrator manual shall provide a provide a clear and concise description of CITS, CITS Computer subsystem, CITS software, CITS databases, interfaces with other systems, tools, and procedures for managing CITS, configuration and diagnosing their performance and problems. The following are suggested topics for the System Admin Manual:

- High-level and detailed description of CITS, the CITS Computer subsystem, and interfacing equipment at the Facility and onboard systems
- Detailed description and instructions on the configuration of the CITS interface with Citilink's wireless network and WAN
- Instructions on the setup, configuration and operation of applicable software for the dispatch workstations, Maintenance Workstation, AVA Editor workstation, and CITS website
- Instructions on the use of performance measurement and analysis tools
- Procedures for system backup
- Management of system access, security features, user accounts and passwords, and user privileges
 - Instructions on installing software updates provided by the Contractor and third-party software suppliers
- Procedures to manage and diagnose interfaces with connected systems such as the fiber connection between the Citilink facility and the Central Station, and internet connections
- Procedures for sending PSA messages to buses, app, and website
- List of the most common failures
- Equipment and operating system error messages, diagnostics, and remedial actions

- Procedures to troubleshoot equipment and software problems on all CITS equipment and the CITS website, app (option) and CITS interfaces

6.6 CITS DATA ADMINISTRATION MANUAL

The CITS Data Administrator manual shall provide a clear and concise description of CITS, CITS Computer subsystem, CITS software, CITS databases, interfaces with other systems, tools, and procedures for managing CITS databases. The following are suggested topics for the Data Admin Manual:

- High-level and detailed description of CITS, the CITS Computer subsystem, and interfacing equipment at the Facility, bus yard, onboard systems
- Structure, data dictionary, interfaces, and functions of all CITS software and databases
- Tools and procedures for maintaining, updating, configuring, diagnosing, repairing, archiving, and restoring CITS databases
- Instructions on the configuration of system settable parameters
- Procedures for updating the AVL map database by importing revised base maps, routes, bus stops, etc
- Creating and loading new messages and/or pull-down lists for the webpage
- Procedures for modifying the Route and Stop and AVA databases
- Procedures for importing updated route and schedule databases
- Distribution of map updates to all map-equipped workstations
- Managing downloads and uploads via the Citilink wireless network
- Maintaining interfaces with existing external systems
- Generating, deleting, modifying, and installing new reports including the use of ad hoc queries
- Updating the audio/visual AVA messages
- Recording new AVA messages, defining the trigger point locations for each message, and adding, deleting, modifying, and downloading the messages to the vehicles
- Description of external interfacing data formats, semantics, and protocols
- Modification of APIs
- Identification of error conditions detected within CITS software, and the messages or indications for those conditions
- Procedures to diagnose CITS software functional or performance problems
- Procedures to install and test new software
- Procedures for entering scheduling, driver, and vehicle information needed by CITS for the assignment of buses and drivers

7 TRAINING

The following are the suggested quantities of training to provide the knowledge needed by Citilink staff to manage and maintain CITS. Training materials and tools for the training sessions shall also be provided.

TABLE 7-1 Training Classes for Citilink

	Informal Training 8 hr. days	Formal Training 8 hr. days	Follow up Training 8hr days	Max Students /Class	# of Formal Classes
Operator Trainer/ Instructor	0.5	1	0.5	16	1
Dispatcher/Supervisor/Maintenance	2	2	2	9	3
Onboard Equipment Maintenance	0	0.5	0.5	10	2
System Administrator	0.5	1	0.5	4	1
Data Administrator	0.5	1	1	4	1
Management	0	0.5	0	10	2

The Contractor shall make enhancements to the course as often as necessary to improve the quality and completeness of the course.

The Contractor shall submit within 45 days after NTP, a complete plan for providing the training described herein for Citilink approval.

The training plan shall include the course description and course objectives for the trainees, each of which shall be measurable.

The training plan shall include an overview of delivery methods for each course, including hands-on and group work experience.

The training plan shall include a list of equipment, tools and test equipment, manuals, and other materials to be used as trainer aids.

The training plan shall include descriptions of the procedures to be performed by trainees during hands-on training or group work.

The training plan shall include a list of training site requirements.

The training plan shall include a proposed schedule for each class that is linked to the installation process and constrained by availability of trainees away from regular duties.

The training plan shall include a description of the pre-requisite knowledge for each course. The Contractor may assume each trainee has worked in a similar role to that intended for the trainee.

The training plan shall include resumes of the personnel proposed to be trainers for each class that demonstrate that trainers are experienced, effective training professionals.

Option: In addition to the classroom training, the Contractor shall provide computer-based self-study tools for vehicle drivers to refresh themselves on procedures.

7.1 GENERAL COURSE REQUIREMENTS

The training courses shall be developed under the guidance of a professional courseware developer. The training shall include hands-on training using the versions of the hardware and software installed in CITS.

The presentation methods for the courses shall conform to the following:

- Founded on an explicit sequencing strategy based on typical trainee characteristics
- Serve multiple learning styles
- Be heavily hands-on or group-based, particularly for skills development
- Contain tell-show-coach-evaluate sequences for skills
- Contain group and cooperative learning
- Include role play where dealing with human interactions
- Provide for independent reading, with workbook, manuals, or computer workstation

The course materials shall accurately reflect the equipment configuration and operation.

The organization and content of course materials shall be clearly directed to achieve the course objectives. There shall be no extraneous material. The course material shall be organized into the order of presentation (except for reference exhibits). The language used shall be at a level that is appropriate for the particular training group, with concise statements and well-structured paragraphs.

All terms in the course materials shall be defined. The material shall assume the trainee has the appropriate prerequisite knowledge.

The course material shall be of uniform appearance and style, across the documents (page layout, fonts, pagination) and within each class of material (quizzes, case studies, text, etc.). The page layout shall be high contrast and low density to enhance interest. The key points shall be highlighted. Graphics shall be used that support the content. The course printed materials shall be assembled for accessibility for in-class and on-the-job reference, with tabbed sections and content-related labels.

The Contractor shall provide the course materials in a widely used electronic format that is acceptable to Citilink.

The Contractor shall grant Citilink all rights to reproduce or modify the training materials for its own use.

Course supporting devices, including a "Bus in a Box," workbench tools, and workstation or workstation simulators shall match those to be used on the job.

A course test and evaluation instruments shall be included. These shall measure progress against objectives. Tests for prerequisite knowledge and on-the-job knowledge shall be included. The test results shall be reviewed by the Contractor and Citilink. The Contractor shall make changes to the course material as result of this review.

The Contractor shall provide sufficient training materials for each trainee for each course listed in Table 7-1.

The Contractor shall provide special tools and equipment in sufficient quantity to support the schedule of classes in the Training Plan.

The training sessions shall be scheduled between the completion of CITS design and the start of installation. Training shall be completed before installation of the CITS subsystem is to be used by the trainees. Training shall not take place more than two months before the CITS system is to be used by the trainees.

The Contractor shall submit the training materials for each course listed in Table 7-1, no later than thirty days prior to the scheduled start of the first class for that course, for Citilink approval.

7.2 COURSE CONTENTS

7.2.1 Driver Trainer/Instructor

The Driver Trainer/Instructor class shall provide instructions to Citilink trainers both in the subject matter and how to present the training to Citilink drivers on the use of the Onboard CITS subsystem.

The Driver Trainers shall receive a segment of primarily classroom instruction with the following suggested topics:

- CITS overview
- Onboard CITS subsystem overview and description of all functions
- Bus and MDT startup and shutdown procedures
- Definition of all MDT display symbols and labels
- MDT keypad training
- Procedures for the navigation of the MDT screens
- Instructions on all procedures discussed in the Driver manual
- Description of all alarms and messages, and procedures for remedial action for each alarm and message
- Review of the help guide for the most common failures and explanation of error codes and error messages

The Contractor shall provide a Trainer's Guide for this course. The Trainer's Guide shall show trainer and trainee material side-by-side, with the trainer portion containing the time needed for each step and clearly describe the details of how to:

- Present material
- Lead group work
- Run exercises and activities
- Operate special equipment

The Trainer's Guides shall contain supporting material beyond the material for trainees, including:

- An explanation of the instructional and sequencing strategies
- Suggested questions and answers for discussions
- Evaluation steps that demonstrate knowledge, comprehension, and application

- Appropriate media to use for each step
- Checklist of materials and tools

The driver trainers should also have a segment of working with a dispatch system to aid in their understanding of CITS. This shall include classroom instruction on the functions of the dispatch workstation, hands-on operation of the communication related functions of the dispatch workstation, operation of an MDT while observing the answering dispatch workstation and responding to a wide range of problem scenarios.

The materials and facilities for the Driver Trainer/Instructor class should include presentation materials, CITS Driver manuals; Citilink procedures and policies manuals; workbooks; pocket size Quick Reference Cards; fully functional bus MDTs for the trainees to use; Bus in a Box with interfacing subsystems or emulators for AVL, AVA,; and a fully functional dispatch workstation. The AVL emulation shall be controllable through a trainer's workstation to simulate a bus in motion on a specified run, with nominal and off-route/off-schedule conditions.

7.2.2 Dispatcher/ Supervisor/Maintenance

The Dispatcher/Supervisor/Maintenance class shall provide instructions to Dispatchers and Operations Supervisors that perform dispatching duties on the use of the dispatch workstation and other CITS workstations.

The Dispatcher/Supervisor/Maintenance class shall provide instruction to staff that use the Maintenance Workstation to view vehicle locations for road calls and view vehicle status information.

The Dispatcher/ Supervisor/Maintenance class shall provide instructions to Operations Supervisors on the use of a tablet that has access to CITS dispatch functions.

Dispatchers/ Supervisors/Maintenance should receive a segment of primarily classroom instruction. Suggested topics include:

- CITS overview
- Dispatch and Maintenance workstation descriptions
- Using the graphical displays to locate and track buses and also locate the nearest supervisor vehicles
- Managing uploads and downloads via the wireless network
- Dispatch workstation graphical and tabular display descriptions
- Definition of all display symbols and labels
- Easy to understand functional flowcharts for commonly used features
- How to navigate from one function to another
- Making modification of driver and bus assignments
- Interpreting of bus performance and health data
- Interpreting of bus status reports

- Instructions on all procedures discussed in the Dispatcher manual and Operations Supervisor manual
- Description of all alarms and messages, and procedures for remedial action for each alarm and message

The classroom work should include responding to a wide range of problem scenarios while working with the dispatch workstation and observing the interactions with Dispatchers and drivers using their onboard equipment. The classroom work shall include responding to a wide range of problem scenarios and observing the interactions with Operations Supervisors and drivers using their onboard equipment.

The materials and facilities for the Dispatcher/ Supervisor/Maintenance class shall include presentation materials, Dispatcher Manuals, Operations Supervisor Manuals, Citilink procedures and policies manual, workbooks, fully functional dispatch workstation, portable radio, mobile radio, and a Bus in a Box.

7.2.3 Onboard Equipment Maintenance

The Onboard Equipment Maintenance class shall provide instructions to maintenance staff on the maintenance, removal, and repair of the Onboard CITS Subsystem and its components.

Onboard equipment maintenance staff should receive a segment of classroom instruction. Suggested topics include:

- CITS overview
- Functional description of the Onboard CITS Subsystem
- Physical layout of the CITS components
- Installation drawings and diagrams showing the wiring between Onboard CITS components and all applicable onboard systems such as the PA system, speakers, LED sign, headsign, battery, and other onboard systems
- Photos of the installed CITS components
- Easily read functional flowcharts for diagnosis of the most common equipment failures
- Understanding error codes and messages
- Instructions on all procedures discussed in the Onboard Equipment Maintenance manual.
- Interpreting of bus performance and health data
- Description of all alarms and messages, and procedures for remedial action for each alarm and message
- Instructions on witnessing acceptance tests of the Onboard CITS subsystem

The materials and facilities for the Onboard Equipment Maintenance class shall include presentation materials, Onboard CITS Maintenance manuals, Citilink procedures and policies manuals, workbooks, Bus in a Box, uninstalled Onboard CITS subsystem components, fully functional installed Onboard CITS subsystem that is linked to a fully functional dispatch workstation.

7.2.4 System Administrator

The System Administrator class shall provide instructions to Citilink staff on the management of the CITS computer components and software.

The IT staff and other Citilink staff responsible for the oversight and management of the CITS Computer subsystem and other CITS computer components, interfaces, and software shall receive a segment of primarily classroom instruction. Suggested topics include:

- High-level and detailed description of CITS, the CITS Computer subsystem, workstations with installed CITS software, and interfacing equipment at the Facility, Central Station, and onboard systems
- Detailed description of the CITS interface with Citilink LAN, wireless network, and WAN
- Detailed description on the structure, organization, and functionality of the CITS system software, application software, CITS databases, and CITS interfaces
- List of the most common failures
- Instructions on all procedures discussed in the System Administrator manual.

The System Administrator informal training shall be completed before the installation of CITS deployment. The formal training shall use the final version CITS software and associated documentation.

The materials and facilities for the System Administrator class shall include presentation materials, CITS System Administrator manuals, workbooks, fully functional management workstation with access to the CITS Computer Subsystem and other CITS workstations, CITS databases, and external databases.

7.2.5 Data Administrator

The Data Administrator class shall provide instructions to Citilink staff on the management of the CITS databases and related software.

The IT staff and other Citilink staff that are responsible for the data administration support for CITS shall receive a training course that includes the following suggested topics:

- High-level and detailed description of CITS, the CITS Computer subsystem, and interfacing equipment at the Facility, Central Station, onboard systems.
- Structure, data dictionary, interfaces, and functions of all CITS software and databases.
- Description of external interfacing data formats, semantics, and protocols.
- Tools and procedures for maintaining, updating, configuring, diagnosing, repairing, archiving, and restoring CITS databases.
- Identification of error conditions detected within CITS software, and the messages or indications for those conditions.
- Instructions on all procedures discussed in the CITS Data Administrator manual.

The informal training shall be completed before the installation of CITS equipment. The formal training shall use the final CITS software and associated documentation.

The demonstrations shall use typical data, including typical data inconsistencies.

The materials and facilities for the Data Administrator class shall include presentation materials, CITS Data Administrator manuals, workbooks, a fully functional management workstation with access to the CITS Computer Subsystem, and other CITS workstations, CITS databases, and external databases.

7.2.6 Management

The Management class shall provide instructions to Citilink management on the use of the CITS Management workstations to view CITS information.

Managers and Citilink staff that deal with public affairs shall receive training with the following suggested topics:

- CITS overview
- A list of the data collected by CITS
- How to view information on the CITS displays
- How to navigate from one function to another
- How to retrieve information from CITS
- How to review schedule adherence data reports generated by CITS
- How to enter scheduling, driver, and vehicle information needed by CITS for the assignment of buses and drivers
- How to share data from CITS with the public
- The legal requirements fulfilled by CITS
- How to generate and access standard fleet management reports provided by CITS
- How to create custom queries
- How to create and post system alert messages on the website
- Capabilities and limits of CITS

The materials and facilities for the Management class shall include presentation materials, workbooks, a fully functional management workstation with access to the CITS Computer Subsystem, and other CITS workstations, CITS databases, and external databases.

8 ACCEPTANCE TESTING

The Contractor shall test each item (including software) provided under this Contract to assure that it is compliant with the Agreement and Specifications, approved design concepts, and is free of manufacturing and/or material defects.

The Contractor shall perform additional testing and pre-testing so that the formal tests with Citilink can be executed efficiently and effectively, with minimal failures.

Individual components shall be tested at the Contractor's factory. Testing at the original equipment manufacturer's factory may be substituted for this testing only.

The subsystems shall be tested at the Contractor's factory prior to shipment to Citilink. The Factory Acceptance Test (FAT) shall fully exercise functionality of the subsystems to prove design and interface characteristics. Factory testing shall be intended to simulate the installed environment as closely as practical.

An Onboard subsystem demonstration shall be held within five months after a notice-to-proceed is issued to the Contractor. This demonstration shall identify the Contractor's progress in developing the Onboard CITS Subsystem and shall assist in acclimating Citilink personnel to CITS.

An Onboard CITS Core First Article (CFA) testing shall be conducted, with all components installed on a selected set of Citilink buses, to demonstrate substantial progress and to identify and document the installed Onboard CITS Subsystem physical configuration. Field Testing shall prove the system functionality prior to installation on the full fleet.

Following a successful Onboard CITS CFA and satisfaction of the punch list items from the CFA, CITS shall be implemented on the full fleet. The field-testing shall be closely coordinated through the Contractor's installation plan. All Onboard CITS Subsystems shall be evaluated on the full fleet in revenue service through an extended reporting period.

The final acceptance tests of the complete CITS shall be conducted to identify and correct any deficiencies found through use of the fully installed CITS for an extended period.

All testing shall be conducted in accordance with the approved testing plans and procedures. All test results shall be documented and submitted to Citilink in formal test reports.

The acceptance tests shall not disrupt Citilink operations.

Regression tests shall be conducted upon the installation of any new software or patches.

During the acceptance test period, the data transfer functions and data accuracy and data integrity shall be monitored. All failures that are not attributable to the operation of a specific component shall be recorded as network failures. The network failures shall also include the failure to produce a report and the failure to register an alarm condition. Citilink shall be informed, in writing, of any network failures within five (5) days of their occurrence and the Contractor shall take corrective action to alleviate such failures. Any system failure or condition that is not meeting the Contract requirements and/or not reported by the Contractor shall result in a restart of the acceptance testing period for the Article under test.

8.1 TEST ADMINISTRATION

All tests shall be administered by the Contractor under Citilink supervision. The Contractor shall provide maintenance for CITS as necessary during the tests. This maintenance shall be noted by the Contractor in a log to be sent to Citilink. The log shall remain the property of Citilink.

The Contractor shall furnish all test equipment and test personnel. The test equipment shall have been calibrated within one year of date of test by a method recognized in the industry. The test personnel shall be properly trained, experienced technicians who are intimately familiar with the system. Testing personnel shall be situated on the vehicle (in the field) and at the Citilink facilities. All CITS functions shall consistently be tested on a full day schedule. All testing data shall be documented.

The Contractor shall provide Citilink's designated test administrator with a minimum of four weeks advance notice of each scheduled test, a minimum of three weeks to review the test procedures, and ample opportunity to inspect system components, and observe all testing at the Contractor's factory and the Citilink facility.

All testing and interpretation of results will be the responsibility of Citilink's designated test administrator. Citilink's test administrator will review the information and data provided by the Contractor and determine whether the subsystems, and/or integrated system have performed in accordance with the Agreement and Specifications. The Contractor shall accept the determinations made by the Citilink test administrator.

8.2 CLASS FAILURE

Repeated malfunctions of similar components or subsystems shall be considered as a single Class Failure. The Class failures shall be formally assessed during the CFA, and final System Acceptance Test periods, according to the following table:

Test	Period	Criteria for Class Failure
CFA	14 days	For each type of System Component, 20% of the installed quantity of the System Component or two (2), whichever is lesser.
SA	1 Month	For each type of System Component, 10% of the installed quantity of the System Component or two (2), whichever is lesser.

All system components that experience a Class Failure during the acceptance testing shall be replaced by the Contractor prior to acceptance by Citilink. The failures and corrective time for such components shall be counted in determining the system reliability. In the event a Class Failure occurs, the acceptance testing shall be terminated, and the cause of the Class Failure shall be corrected. The acceptance testing shall be restarted after the correction of the Class Failure.

The Contractor shall accept the determination of the Citilink test administrator as final in the interpretation of any failure, malfunction, error, or other event during the test.

8.3 COMPONENT TESTS

The Contractor shall demonstrate that each field replaceable component of CITS meets or exceeds the requirements of the Agreement or this Specification. In cases where the field replaceable unit or subsystem in question is substantially similar in design and application to a component previously used in a similar application, the design may be qualified through submission of revenue service data, subject to Citilink approval.

In all other cases, the Contractor shall be required to conduct a proof-of-design test that demonstrates that all requirements of the Agreement and this Specification, including environmental requirements, are met. If a test is failed, the Contractor shall make any necessary modifications to the component and rerun the tests until they are successfully completed.

The Contractor and sub-suppliers shall perform production inspections and tests on each component that is produced as an integral part of their quality assurance program. These inspections and tests shall verify that all components contain the correct materials, are assembled properly, and function properly. Citilink may choose to observe, participate in, conduct, or repeat testing on any item to confirm the validity of the Contractor's test procedures and results.

The Contractor shall perform production inspections and tests at the point of manufacture on all components and on each completed subsystem prior to each shipment.

The production inspection and testing sheets and procedures shall be updated based upon experience gained from subsequent testing or component operation. The test procedures shall be expanded to focus on areas that prove to be, or have historically been, troublesome. If approved by Citilink, the tests may be simplified in areas where there is a high degree of confidence that the component meets the requirements.

Complete records shall be kept of all production inspections and tests that are performed. Any failures and subsequent corrective measures shall be noted. These records shall be submitted to Citilink for each occurrence. Successful completion of the production inspections and tests on all components shall be a prerequisite for the installation of the component on Citilink property.

8.4 ONBOARD SUBSYSTEM DEMONSTRATION

The Contractor shall install pre-production units and mock-ups of equipment on two Citilink buses to demonstrate progress in the design development and to provide Citilink personnel with a preview of the Onboard CITS subsystem. The Contractor shall demonstrate that the Onboard CITS Subsystem has been designed with attention to ergonomics, efficiency, and safety for all Citilink personnel that interact with the Onboard CITS Subsystem. The demonstration shall also verify that the features of the MDT are easy to understand, easy to use, and that they respond quickly to the driver's actions.

The Contractor shall analyze comments from drivers and other Citilink personnel regarding the ergonomics and ease of use of the Onboard CITS subsystem. The Contractor shall summarize results of these activities, recommend a course of corrective action, such as modification of the interface, additional user training, or adjustment of component mounting and submit the findings in a report.

8.5 OPTION: FACTORY TESTING

The factory acceptance test (FAT) shall be performed in controlled, laboratory conditions at the Contractor's facilities or other Citilink approved facility.

The FATs at the Contractor's facility shall verify that the major CITS components comply with the Agreement and this Specification, prior to the delivery of the components to Citilink. Related components shall be integrated and tested together to verify compliance of the individual components and their interface(s). The interfaces between components are viewed as crucial aspects of the CITS design. To verify these interfaces, the tests of the subsystems shall include as many subsystems interfaced together as possible.

8.5.1 Onboard CITS Subsystem

Two complete Onboard CITS subsystems incorporating the following components shall be tested: Onboard CITS Processor, mobile data terminal (MDT), router from Citilink, dead reckoning navigation components, and power conditioning. Wireless communications via the cellular data and wireless network shall be simulated at signal levels to resemble levels at the Citilink Facility and throughout the Citilink service area. Additional components such as the interface to the onboard LED sign, PA, headsign, shall also be tested.

Testing shall be initially performed on two units as proof of design, prior to general production.

At least fifteen percent of the onboard subsystems shall be factory tested prior to shipment to Citilink.

The testing shall verify complete onboard subsystem functionality, as per Section 3 and 4 of this Specification, including the following:

- Verification of driver work assignment
- Verification of accurate MDT displays
- Text messaging using the MDT
- AVL reporting using GPS derived vehicle location
- AVL reporting using dead reckoning derived vehicle location
- Time of day synchronization
- Transfer of data via wireless network
- Audio and text announcements of next stops and general service announcements
- Headsign control
- Option: Pre-trip verifications using the MDT
- Option: Pre-trip inspection using the MDT
- Option: Activation and reporting of SAS

8.5.2 CITS Workstations

Workstations with CITS software installed shall be factory tested. An interface of the CITS workstations with the CITS Computer Subsystem and CITS database at the hosted site via the internet connection

shall be verified. Communications with buses via the wireless network using signal levels that resemble levels at the Facility shall be demonstrated.

The testing shall verify the complete functionality of the CITS workstations as per Section 3 and 4 of this Specification, including the following:

- AVL map display functionality
- Tabular listing of vehicle status and incidents
- Incident report creation and accuracy verification
- Use of Workstation to view bus locations and status
- Download of route and schedule database from the CITS Computer Subsystem
- Upload of route and schedule, and AVA databases to buses via the wireless network
- Download of AVL, and vehicle status data from buses via the wireless network
- Report generation functionality and accuracy verification
- Custom report queries
- Sending and receiving data messages
- System login
- Remote login of bus drivers
- Schedule import
- Archival of data in the CITS Database
- Verification of compliance with system response time requirements in Section 1
- Verification of compliance with the single point of failure and availability requirements in Section 3 of this Specification
- Demonstration of failure modes
- CITS alarm reporting
- Peak activity loading shall be tested using simulated system events representing up to 150% of the expected quantity of system events
- System re-start capability shall be exercised by shutting down and restarting all processes, several times.
- Option: SAS processing

8.5.3 Traveler Information Subsystem

The testing shall verify the functionality of the Traveler Information Subsystem, including the website, app (option), and SMS messaging, (option).

At a minimum, the following functions shall be tested:

- Prediction of vehicle arrivals

- Website display of real-time arrival predictions, real-time vehicle locations, and (real-time traffic (option)) on a computer, smartphone, and tablet
- Website functionality to identify the user’s bus stop
- Website display of system alerts
- App functionality including demonstrating its responsive design
- Option: Registered user functionality including establishing favorites
- Option: SMS functionality including messages with real-time arrival predictions

8.5.4 Expansion Capability

The expansion capability of CITS to support at least six workstation positions, including workstations located remotely; and six management monitoring positions that provide access to all CITS information shall be demonstrated as part of the Factory Testing.

Compliance with all CITS expandability requirements shall be demonstrated as part of the Factory testing.

8.6 ONBOARD SUBSYSTEM CORE SYSTEM-FIRST ARTICLE

The Onboard Subsystem Core First Article shall demonstrate the installed CITS Computer Subsystem and the installed Onboard CITS subsystems meet or exceed the requirements in the Agreement and this Specification. The Onboard Subsystem Core First Article testing shall not commence until all CITS Computer Subsystem components have been implemented at the Host sites and Onboard CITS subsystems for one bus of each type have been delivered and installed, all system interfaces have been established, and the “debugging” has been completed.

The Core First Article Inspection (CFA) tests shall be performed at the Citilink Facility, on Citilink routes, and at selected locations within the City of Fort Wayne. The CITS Computer Subsystem, dispatch workstations, Maintenance Workstation, AVA Editor Workstation, link to the Hosted site, interface to the Citilink wireless network, interface to the cellular data network shall be fully implemented and interconnected. Access to the management workstations to CITS via the internet shall be tested and demonstrated. Final versions of all required software shall be installed.

At a minimum, implementation of the following components shall have been completed:

- At least one dispatcher workstation shall be operational
- Interface to the Citilink wireless data network
- Interface between the dispatch workstation and the CITS Computer Subsystem located at the hosted site
- If applicable, complete installation of the CITS network infrastructure
- Interface to CITS network and databases
- Fully installed Onboard CITS Subsystems on one bus of each bus type

The testing shall use data collected from the installed vehicles and other CITS subsystems—no simulated data shall be used.

At a minimum, the following functions shall be tested and verified:

- Sending and receiving canned and text messaging
- All CAD and schedule adherence displays and functions
- Route adherence tracking and route deviation alarms
- All MDT functionality
- AVL map display functionality, updates, zoom, icons, configurations, and display accuracy
- AVL tracking accuracy and polling rate
- Tabular listing of vehicle status and incidents
- Headway display
- CAD information and map display correlation
- Incident report creation
- Report generation functionality and accuracy verification
- Custom report queries functionality
- AVL playback functionality
- System login via the MDTs
- Remote login of bus drivers
- Route and schedule, vehicle ID, driver ID import
- Option: Turn by Turn functionality on MDTs
- Option Single sign on using the MDT and the automated control of the headsign
- Option: Silent alarm activation, SAS map display, MDT display, and the clearing of a silent alarm

At a minimum, the following additional functions shall be tested and verified:

- AVA functionality and accuracy
- Add, modify, and delete AVA announcements
- Headsign control
- Schedule, AVA database and other database uploads to vehicles
- Maintenance Workstation management of vehicle data downloads
- Display of incident reports involving road calls on the Maintenance workstation
- Playback functionality and accuracy
- Real-time arrival predictions functionality on CITS website, app (option), and SMS (option)
- Verification of compliance with the single point of failure requirements in Section 3 of this Specification

- Failure sensing, switchover, and system recovery
- Recovery from simulated failures such as loss of cellular data

The Contractor shall complete all training for the bus driver trainers and the Operations Supervisors prior to the commencement of the Onboard Subsystem Core First Article testing.

Since the CFA vehicles shall be the prototypes for all subsequent vehicle installations, the exact installation details shall be fully documented.

The CITS subsystems shall be fully functionally tested prior to simulated revenue service and while the CFA vehicles are in regular service.

8.7 SYSTEM ACCEPTANCE TESTING

A 30-day formal System Acceptance test shall demonstrate that the entire fully installed and fully integrated CITS complies with the Agreement and this Specification.

The System Acceptance test shall not commence until all CITS Subsystems, components, and materials of the Contract have been delivered, installed, implemented, interfaced, and “debugging” has been completed. All training shall have been completed prior to the initiation of the system acceptance testing.

Defects found by Citilink during the System Acceptance testing will be promptly reported to the Contractor. The repair/correction shall be the Contractor’s sole cost and expense. Each repair/correction shall be documented in a test report to be provided to Citilink.

8.7.1 Integrated System Functional Test

The System Acceptance testing shall, at a minimum include the following:

- Text messaging including text announcements to a bus, subgroup, group, route, or all buses
- Data transmission throughput measurements
- AVL map display functionality, updates, zoom, icons, configurations, and display accuracy
- AVL tracking accuracy and polling rate
- Tabular listing of vehicle status and incidents
- System login via the MDTs and CITS workstations
- Remote login of bus drivers
- Schedule import and other imports of Citilink data
- Display of arrival information on electronic signs at Central Station.
 - Option: Text messaging to the Onboard LED signs for a single bus, subgroup, route, or the entire fleet and the CITS website
 - Option: SAS functionality including map display of nearest vehicles to bus in the SAS alarm state

The System Acceptance testing shall also include the following:

- Data export including GTFS via Citilink interfaces and APIs
- Interface of CITS Database with other Citilink systems
- Report generation functionality and accuracy verification
- Custom report queries functionality
- Alarm reporting via the wireless data communications
- Schedule downloads to vehicles
- Maintenance Workstation management of downloads
- Display of road calls on the Maintenance Workstation
- Webpage functionality
- CAD displays of schedule adherence
- Schedule adherence accuracy and change in schedule tolerance functionality
- Response times with data communications, and CITS data traffic loads for a worst-case busy hour
- Verification of compliance to any requirements in the Agreement and Specifications that have not be verified during a previous Acceptance test.
- Option: app functionality
- Option: SMS messaging functionality

The System Acceptance testing shall also include the following:

- Playback functionality and accuracy
- AVA functionality and accuracy verification
- Correlation between supplied documentation and actual operation
- Accuracy of the Traveler Information Subsystem data
- Accuracy of information provided on webpage
- Add, modify, and delete routes on webpage
- Add, modify, and delete messages on webpage
- Add, modify, and delete pull-down menus on webpage
- Interface to real time GTFS
- Static interface to GTFS
- CITS API and accuracy verification
- Data archival in the CITS Database and retrieval

8.7.2 Database Validation

All CITS databases shall be validated. The databases shall be validated through generation of reports and analysis of all reported “abnormal conditions” to determine whether the reported “abnormal conditions” are due to a database anomaly. Off-route and off-schedule reporting parameters shall be set to their minimum values.

Abnormal conditions shall be recorded and investigated to determine if systemic errors exist. The deficiencies shall be corrected. Documentation of anomalies and corrections shall be furnished to Citilink.

8.7.3 System Acceptance 30-Day Monitoring

The Contractor shall continue to provide an on-site test representative for 30 days from the inception of the System Acceptance Tests.

The Contractor shall work with the Citilink test administrator to investigate and categorize CITS failures and to work with Citilink to repair CITS related failures.

At the end of the monitoring period, the Contractor shall prepare a report assessing the system performance vs. availability and reliability requirements and a report noting compliance with all paragraphs of the technical specification. Corrective actions shall be suggested if CITS does not achieve the required reliability and availability. Citilink will review the recommended corrections and provide guidance to the Contractor regarding the Contractor’s actions to correct any deficiencies.

8.7.4 Major Failure

Any major failure of a component during the System Acceptance test period shall be cause to stop the System Acceptance Test until repairs are made and validated by Citilink, at which time a new System Acceptance test shall begin.

Major failures include, but are not limited to the following:

- Crash of any dispatch workstation or CITS application lockup
- Crash of the CITS Computer Subsystem requiring a reboot
- System recovery failure
- Crash of schedule adherence functionality and/or CITS subsystem which interrupts the tracking of vehicles
- Crash of the CITS website
- Loss of access to the CITS databases
- More than one spontaneous switchover to redundant equipment which requires repair or replacement of a failed module
- Demonstrably slow response of any CITS subsystem during busy periods
- More than one call for repair or service on any day for a CAD subsystem, website, or CITS dispatch workstation, electronic sign display failure
- Option: Crash of the CITS app

9 SUBMITTALS AND DESIGN REVIEWS

The Contractor shall submit CITS design information as appropriate for the Work and as described in the specifications to Citilink for evaluation and approval.

9.1 PRELIMINARY DESIGN SUBMITTAL

The Contractor shall provide a preliminary design submittal within ninety (90) days after Notice to Proceed. This submittal shall be reviewed in detail with Citilink and their designated representatives to verify that all aspects of the Contractor's design are in conformance with the Specification and Agreement requirements and are fully understood by Citilink. In the event additional elements are planned for a subsequent implementation, those elements shall also be addressed detailing the CITS capacity that will be necessary for the additional elements. The Contractor shall demonstrate that additional elements could be added later without an adverse impact to the current hardware and software being implemented. The Contractor shall submit at least four printed copies and an electronic copy in a format that is accessible by Citilink.

The preliminary design submittal shall include a complete description of each CITS subsystem and component, and a detailed project schedule. At a minimum, the overview shall describe the functionality of the CAD subsystem, and data communication interfaces, the electronic signs and their interface to CITS, Traveler Information, Onboard CITS Subsystem, as well as optional items that have been exercised.

The preliminary design submittal shall include description of the CITS Computer subsystem, CITS workstations requirements and interface requirements, and Onboard CITS subsystems and their interface requirements, and electronic signs and their mounting.

The preliminary design submittal shall include a comparison of the functionality of the existing software modules for the Contractor's standard product to the CITS functionality requirements. If applicable, the preliminary design submittal shall include software documentation for any new functionality that is being developed for CITS with an emphasis on the user interfaces, and interfaces to external systems.

9.1.1 CITS User Interface and Functionality

The preliminary design submittal shall include a complete description of the CAD user interface including CAD features, AVL map displays, tabular displays, incident reports, SAS functionality (option), and data communication functions, fleet management reports and custom queries, AVL playback, sample screens, a list of the pull-down menus and items, and all software interfaces.

The preliminary design submittal shall include a complete description of the customer interface to the CITS website, app (option), signs at Central Station, and text messaging features (option). The preliminary design submittal shall include a complete description of the AVL map displays, real time traffic displays (option), real-time arrival predictions, sample screens, a list of the pull-down menus and items, and all software interfaces for the Traveler Information Subsystem.

The preliminary design submittal shall include a complete description of the CITS system administrator interface.

9.1.2 Computer Subsystem

The preliminary design submittal shall include a complete description of the Computer subsystem including the servers and other components at the Host sites; dispatch, management AVA Editor and Maintenance workstation software installation plans and interfaces, UPS, data archival, CITS Database, and installation information at the Host sites and at the Facility.

9.1.3 Onboard CITS Subsystem

The preliminary design submittal shall include a complete description and functionality of the CITS Onboard subsystem including the Onboard Processor, wireless router interface, MDT, silent alarm switch (option), interfaces to onboard components such as LED sign, headsign and other route signs, and PA system; and optional onboard items that have been exercised; and installation and mounting information.

A description of the functions performed by the Onboard Processor and the expected loading of the processor shall be provided. The analysis shall show any expected slowdown in processing data or in data communications, based on the normal and worst-case processor loading for the proposed hardware configuration.

The preliminary design submittal shall include current draw information for the Onboard CITS equipment.

9.1.4 Traveler Information Subsystem

The preliminary design submittal shall include

- Detailed description of the algorithm used for the time of arrival predictions and information regarding the accuracy of the predictions shall be provided.
- List of the pull-down menus and items, a sample map display, and sample time of arrival predictions for the website and app.
- Description of the interface to provide predictions on the electronic signs at Central Station.
- Option: Description of the SMS Response subsystem and sample time of arrival prediction announcements texts.

9.1.5 Others

The preliminary design submittal shall include documentation of encryption to be employed for data communications.

The preliminary design submittal shall include a description of the methodology for importing and maintaining Citilink's current route and schedule database and other Citilink information shall be provided. This description shall include how the data will be edited and handled in the CITS databases. The description shall include an estimate of the size of the databases, means for updating the onboard database when route and schedule changes occur.

The preliminary design submittal shall include an estimate of the amount of data that will be transmitted per month via the cellular data system per vehicle and for the entire CITS fleet.

Option: The preliminary design submittal shall include a detailed description of the SAS switches for Citilink approval prior to their procurement.

9.2 FINAL DESIGN SUBMITTAL

The Contractor shall provide a final design submittal within four months after the Notice to Proceed. The submittal shall be reviewed in detail with Citilink and their designated representatives to verify that all aspects of the Contractor's final design are complete, in conformance with the Specification and Agreement requirements, and are fully understood by Citilink. The Contractor shall submit at least four printed copies of the final design submittal and an electronic copy in a format that is accessible by Citilink.

The final design submittal shall include a complete description of each CITS subsystem and component provided in the preliminary design submittal with updated technical information, and an updated detailed project schedule.

The final design submittal shall provide details of each subsystem, list changes and updates that have been made since the preliminary design submittal to the CAD functionality, data communication functionality, Traveler Information functionality, as well as the functionality of optional items that have been exercised. When pre-printed materials are used in a submittal, the specific model number, and options to be furnished shall be clearly identified.

The final design submittal shall include final installation drawings and mounting plans for all CITS subsystems and components at the Facility and host sites. If applicable, scaled drawings furnished shall show the arrangement of racks at the Citilink Facility and host sites, routing of interconnection cables, routing of power and ground cables, and transmission line installation details. The drawings shall show a parts list for mounting hardware.

The final design submittal shall include documentation of all interfaces with external systems.

The final design submittal shall include installation plans for all CITS subsystems, including the installation plan for the Onboard CITS Subsystems that list the anticipated number of Contractor personnel, expected production per shift, sequence of vehicles, and the requested support from Citilink.

The final design submittal shall include the test plan for the Onboard Subsystem Core First Article test.

The final design submittal shall include test plans for the acceptance of each Onboard CITS Subsystem after installation. The procedure shall include verification with other onboard systems and components.

The final design submittal shall include a complete description of the software and firmware applications being furnished, including the software version and the options selected, and complete interface ICDs to all external systems.

9.3 DESIGN REVIEWS

The Contractor shall conduct formal presentations of the Preliminary Design and the Final Design submittals for CITS. The preliminary and final design reviews shall be at least two days in length but no more than five days.

All key Contractor personnel and presenters shall be present for the design reviews.

The design review presentations shall be scheduled approximately three weeks after submission of the presentation materials to Citilink for review.

At least six copies and an electronic copy in a format that is accessible by Citilink shall be submitted for each design review.

The Contractor shall present the design submittal in sufficient detail to demonstrate the details of achieving compliance with the Contract requirements. Use of mockups, samples, and demonstrations of the user graphical user interfaces is encouraged.

The Contractor shall furnish minutes of the design review meetings.

The Contractor shall address all of the issues and concerns provided by Citilink and submit a formal response. Citilink may require an additional design review presentation or design review submittal if Citilink determines the issues and concerns are sufficient to warrant an additional presentation or submittal.

10 TERMS AND CONDITIONS

10.1 PAYMENT MILESTONES

Payment Milestones for the CITS Project shall be as follows:

Completion of Design Review and Design Submittals	10%
Completion of Core First Article Test and Schedule Import from Remix	20%
Completion of Onboard Installations	20%
Completion of Training, Manuals, Reports	10%
Completion of Electronic Signs	5%
Completion of System Acceptance Test	10%
Completion of Website and API	10%
Completion of Close Out	10%
Completion of Warranty	5%

10.2 FEDERAL TERMS AND CONDITIONS

FTA REQUIRED CLAUSES INCORPORATION OF FEDERAL TRANSIT ADMINISTRATION (FTA) TERMS

FTA Circular 4220.1F

The preceding provisions include, in part, certain Standard Terms and Conditions required by DOT, whether or not expressly set forth in the preceding Contract provisions. All contractual provisions required by DOT, as set forth in FTA Circular 4220.1F are hereby incorporated by reference. Anything to the contrary herein notwithstanding, all FTA mandated terms shall be deemed to control in the event of a conflict with other provisions contained in this Agreement. Contractor shall not perform any act, fail to perform any act, or refuse to comply with any of the Purchaser requests which would cause Purchaser to be in violation of the FTA terms and conditions.

CERTIFICATION OF COMPLIANCE

The undersigned hereby agrees and certifies that it will comply with and meet the requirements of all provisions set forth in this **Exhibit** and all regulations referenced herein.

Signature of Contractor's Authorized Official: _____

Name and Title of Contractor's Authorized Official: _____

Date: _____

INDIANA E-VERIFY AFFIDAVIT

Contractor shall, in accordance with I.C. § 22-5-1.7, enroll and verify work eligibility status of all newly hired employees of Contractor through the E-Verify program or any other work authorization program approved by the United States Department of Homeland Security or the Department of Homeland Security. Contractor further understands that it is not required to verify work eligibility status of newly hired employees of Contractor through the E-Verify program if the E-Verify program no longer exists. Contractor certifies that it does not knowingly employ any unauthorized aliens.

Signature of Contractor's Authorized Official: _____

Name and Title of Contractor's Authorized Official: _____

Date: _____

SIMPLIFIED ACQUISITION THRESHOLD

Contracts for more than the simplified acquisition threshold, which is the inflation adjusted amount determined by the Civilian Agency Acquisition Council and the Defense Acquisition Regulations Council (Councils) as authorized by 41 U.S.C. § 1908, or otherwise set by law, must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate. (Note that the simplified acquisition threshold determines

the procurement procedures that must be employed pursuant to 2 C.F.R. §§ 200.317–200.327. The simplified acquisition threshold does not exempt a procurement from other eligibility or processes requirements that may apply.)

NOTIFICATION OF FEDERAL PARTICIPATION

To the extent required by law, in the announcement of any third-party contract award for goods and services (including construction services) having an aggregate value of \$500,000 or more, Contractor shall specify the amount of Federal Assistance to be used in financing that acquisition of goods and services and to express that amount of Federal Assistance as a percentage of the total cost of the third-party contract.

INELIGIBLE CONTRACTORS AND SUBCONTRACTORS

Any name appearing upon the Comptroller General’s list of ineligible contracts for federal-assisted contracts shall be ineligible to act as a subcontractor for Contractor pursuant to this contract. If Contractor is on the Comptroller General’s list of ineligible contractors for federally financed or assisted construction, Agency shall cancel, termination or suspend this contract.

NO GOVERNMENT OBLIGATION TO THIRD PARTIES

(1) Agency and Contractor acknowledge and agree that, notwithstanding any concurrence by the Federal Government in or approval of the solicitation or award of the underlying contract, absent the express written consent by the Federal Government, the Federal Government is not a party to this contract and shall not be subject to any obligations or liabilities to the Agency, Contractor, or any other party (whether or not a party to that contract) pertaining to any matter resulting from the underlying contract.

(2) Contractor agrees to include the above clause in each subcontract financed in whole or in part with Federal assistance provided by FTA. It is further agreed that the clause shall not be modified, except to identify the subcontractor who will be subject to its provisions.

FEDERAL CHANGES

Contractor shall always comply with all applicable FTA regulations, policies, procedures, and directives, including without limitation those listed directly or by reference in the Agreement (Form FTA MA (version 31, May 2, 2024)) current version between Agency and FTA, as they may be amended or promulgated from time to time during the term of this contract. Contractor’s failure to so comply shall constitute a material breach of this contract.

INTELLIGENT TRANSPORTATION SYSTEM PROJECTS

All ITS projects funded with Mass Transit Funds from the Highway Trust Funds shall use applicable ITS standards and interoperability tests that have been officially adopted through rulemaking by the United States Department of Transportation (US DOT). (Also see 5206(e) of the Transportation Equity Act for the 21st Century, Public Law 105-178, 112 Stat. 547, pertaining to conformance with the National Intelligent Transportation Systems Architecture and Standards.)

BONDING REQUIREMENTS

The Contractor may be required to obtain performance and payment bonds when necessary to protect the Purchaser's interest.

(a) The following situations may warrant a performance bond:

1. Purchaser property or funds are to be provided to the contractor for use in performing the contract or as partial compensation (as in retention of salvaged material).
2. A Contractor sells assets to or merges with another concern, and the Purchaser, after recognizing the latter concern as the successor in interest, desires assurance that it is financially capable.
3. Substantial progress payments are made before delivery of end items starts.
4. Contracts are for dismantling, demolition, or removal of improvements.

(b) When it is determined that a performance bond is required, the Contractor shall be required to obtain performance bonds as follows:

1. The penal amount of performance bonds shall be 100 percent of the original contract price, unless Purchaser determines that a lesser amount would be adequate for the protection of the Purchaser.
2. The Purchaser may require additional performance bond protection when a contract price is increased. The increase in protection shall generally equal 100 percent of the increase in contract price. The Purchaser may secure additional protection by directing the Contractor to increase the penal amount of the existing bond or to obtain an additional bond.

(c) A payment bond is required only when a performance bond is required, and if the use of payment bond is in the Purchaser's interest.

(d) When it is determined that a payment bond is required, the Contractor shall be required to obtain payment bonds as follows:

1. The penal amount of payment bonds shall equal:
 - (i) Fifty percent (50%) of the contract price if the contract price is not more than \$1 million;
 - (ii) Forty percent (40%) of the contract price if the contract price is more than \$1 million but not more than \$5 million; or
 - (iii) Two and one half million if the contract price is increased.

Advance Payment Bonding Requirements

The Contractor may be required to obtain an advance payment bond if the contract contains an advance payment provision and a performance bond is not furnished. The Purchaser shall determine the amount of

the advance payment bond necessary to protect the Purchaser.

Patent Infringement Bonding Requirements (Patent Indemnity)

The Contractor may be required to obtain a patent indemnity bond if a performance bond is not furnished and the financial responsibility of the Contractor is unknown or doubtful. The Purchaser shall determine the amount of the patent indemnity to protect the Purchaser.

PATENT RIGHTS IN DATA

2 C.F.R. part 200, Appendix II (F)

37 C.F.R. part 401

Intellectual Property Rights. This Project is funded through a Federal award with FTA for experimental, developmental, or research work purposes. As such, certain Patent Rights and Data Rights apply to all subject data first produced in the performance of this Contract. The Contractor shall grant the Agency intellectual property access and licenses deemed necessary for the work performed under this Agreement and in accordance with the requirements of 37 C.F.R. part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," and any implementing regulations issued by FTA or U.S. DOT. The terms of an intellectual property agreement and software license rights will be finalized prior to execution of this Agreement and shall, at a minimum, include the following restrictions: Except for its own internal use, the Contractor may not publish or reproduce subject data in whole or in part, or in any manner or form, nor may the Contractor authorize others to do so, without the written consent of FTA, until such time as FTA may have either released or approved the release of such data to the public. This restriction on publication, however, does not apply to any contract with an academic institution. For purposes of this agreement, the term "subject data" means recorded information whether or not copyrighted, and that is delivered or specified to be delivered as required by the Contract. Examples of "subject data" include, but are not limited to computer software, standards, specifications, engineering drawings and associated lists, process sheets, manuals, technical reports, catalog item identifications, and related information, but do not include financial reports, cost analyses, or other similar information used for performance or administration of the Contract.

1. The Federal Government reserves a royalty-free, non-exclusive and irrevocable license to reproduce, publish, or otherwise use, and to authorize others to use for "Federal Government Purposes," any subject data or copyright described below. For "Federal Government Purposes," means use only for the direct purposes of the Federal Government. Without the copyright owner's consent, the Federal Government may not extend its Federal license to any other party.
 - a. Any subject data developed under the Contract, whether or not a copyright has been obtained; and
 - b. Any rights of copyright purchased by the Contractor using Federal assistance in whole or in part by the FTA.
2. Unless FTA determines otherwise, the Contractor performing experimental, developmental, or research work required as part of this Contract agrees to permit FTA to make available to the public,

either FTA's license in the copyright to any subject data developed in the course of the Contract, or a copy of the subject data first produced under the Contract for which a copyright has not been obtained. If the experimental, developmental, or research work, which is the subject of this Contract, is not completed for any reason whatsoever, all data developed under the Contract shall become subject data as defined herein and shall be delivered as the Federal Government may direct.

3. Unless prohibited by state law, upon request by the Federal Government, the Contractor agrees to indemnify, save, and hold harmless the Federal Government, its officers, agents, and employees acting within the scope of their official duties against any liability, including costs and expenses, resulting from any willful or intentional violation by the Contractor of proprietary rights, copyrights, or right of privacy, arising out of the publication, translation, reproduction, delivery, use, or disposition of any data furnished under that contract. The Contractor shall be required to indemnify the Federal Government for any such liability arising out of the wrongful act of any employee, official, or agents of the Federal Government.
4. Nothing contained in this clause on rights in data shall imply a license to the Federal Government under any patent or be construed as affecting the scope of any license or other right otherwise granted to the Federal Government under any patent.
5. Data developed by the Contractor and financed entirely without using Federal assistance provided by the Federal Government that has been incorporated into work required by the underlying Contract is exempt from the requirements herein, provided that the Contractor identifies those data in writing at the time of delivery of the Contract work.
6. The Contractor agrees to include these requirements in each subcontract for experimental, developmental, or research work financed in whole or in part with Federal assistance.

TERMINATION

2 C.F.R. § 200.339

2 C.F.R. part 200, Appendix II (B)

Termination for Convenience. Agency may terminate this contract in whole or in part, at any time by written notice to the Contractor when it is in the Government's best interest. The Contractor shall be paid its costs, including contract close-out costs, and profit on work performed up to the time of termination. The Contractor shall promptly submit its termination claim to Agency to be paid the Contractor. If the Contractor has any property in its possession belonging to the Agency the Contractor will account for the same, and dispose of it in the manner the Agency directs.

Termination for Default - Breach or Cause. If the Contractor does not deliver supplies in accordance with the contract delivery schedule, or, if the contract is for services, the Contractor fails to perform in the manner called for in the contract, or if the Contractor fails to comply with any other provisions of the contract, the Agency may terminate this contract for default. Termination shall be effected by serving a notice of termination on the contractor setting forth the manner in which the Contractor is in default. The

Contractor will only be paid the contract price for supplies delivered and accepted, or services performed in accordance with the manner of performance set forth in the contract.

If it is later determined by the Agency that the Contractor had an excusable reason for not performing, such as a strike, fire, or flood, events which are not the fault of or are beyond the control of the Contractor, the Agency, after setting up a new delivery of performance schedule, may allow the Contractor to continue work, or treat the termination as a termination for convenience.

Opportunity to Cure. The Agency in its sole discretion may, in the case of a termination for breach or default, allow the Contractor [an appropriately short period of time] in which to cure the defect. In such case, the notice of termination will state the time period in which cure is permitted and other appropriate conditions.

If Contractor fails to remedy to Agency's satisfaction the breach or default of any of the terms, covenants, or conditions of this Contract within ten (10) days after receipt by Contractor of written notice from Agency setting forth the nature of said breach or default, Agency shall have the right to terminate the Contract without any further obligation to Contractor. Any such termination for default shall not in any way operate to preclude Agency from also pursuing all available remedies against Contractor and its sureties for said breach or default.

Waiver of Remedies for any Breach. In the event Agency elects to waive its remedies for any breach by Contractor of any covenant, term or condition of this Contract, such waiver by Agency shall not limit Agency's remedies for any succeeding breach of that or of any other term, covenant, or condition of this Contract.

BREACHES AND DISPUTE RESOLUTION

- a. Disputes - Disputes arising in the performance of this Contract which are not resolved by agreement of the parties shall be decided in writing by Agency. This decision shall be final and conclusive unless within ten (10) days from the date of receipt of its copy, the Contractor mails or otherwise furnishes a written appeal to the Manager - Purchasing. In connection with any such appeal, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of its position. The decision of the Manager – Purchasing shall be binding upon the Contractor and the Contractor shall abide by the decision.
- b. Performance During Dispute – Unless otherwise directed by Agency, Contractor shall continue performance under this Contract while matters in dispute are being resolved.
- c. Breach of Contract – Contract shall be deemed in breach of contract if Contractor: fails to comply with any term of the Agreement; fails to cure such noncompliance within five (5) calendar days from the date written notice from Agency or such other timeframe , greater than five (5) calendar days

specified in the notice; fails to submit a written response to the notification from Agency within five (5) calendar days after the date of the notice.

- d. Force Majure – Contractor shall not be in breach of the Agreement as long as its default was due to causes beyond reasonable control and occurred without any fault or negligence on the part of both the Contractor and any subcontractors.
- e. Claims for Damages – Should either party to the Agreement suffer injury or damage to person or property because of any act or omission of the other party or of any of their employees, agents, or other whose acts they are legally liable, a claim for damages therefor shall be made in writing to such other party within reasonable time after the first observance of such injury or damage.
- f. Remedies – Unless this Agreement provides otherwise, all claims, counterclaims, disputes, and other matters in question between Agency and Contractor arising out of or relation to this Agreement or its breach will be decided by binding Arbitration if the mutually agree, or in a court of competent jurisdiction within the State of Indiana.
- g. Fees – All costs, expenses and attorney fees incurred by the Contractor in connection with any appeal, suit or claim regarding a dispute that is brought by the Contract shall be paid by the Contractor.

ACCESS TO RECORDS AND REPORTS

49 U.S.C. § 5325

18 C.F.R § 18.36(i)

49 C.F.R § 633.17

1. Where the Purchaser is not a State but a local government and is the FTA Recipient or a subgrantee of the FTA Recipient in accordance with 18 C. F. R. 18.36(i), the Contractor agrees to provide the Purchaser, the FTA Administrator, the Comptroller General of the United States or any of their authorized representatives access to any books, documents, papers and records of the Contractor which are directly pertinent to this Contract for the purposes of making audits, examinations, excerpts and transcriptions. Contractor also agrees, pursuant to 49 C.F.R. 633.17 to provide the FTA Administrator or his authorized representatives including any PMO Contractor access to Contractor's records and construction sites pertaining to a major capital project, defined at 49 U.S.C. 5302(a)1, which is receiving federal financial assistance through the programs described at 49 U.S.C. 5307, 5309 or 5311.

2. The Contractor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.

3. The Contractor agrees to maintain all books, records, accounts and reports required under this Contract for a period of not less than three years after the date of termination or expiration of this Contract, except in the event of litigation or settlement of claims arising from the performance of this Contract, in which case Contractor agrees to maintain same until the Purchaser, the FTA Administrator, the Comptroller General, or any of their duly authorized representatives, have disposed of all such litigation, appeals, claims or exceptions related thereto.

SUSPENSION AND DEBARMENT

2 C.F.R. Part 180
2 C.F.R. Part 1200
2 C.F.R. §200.214
2 C.F.R. Part 200 Appendix II (H)
Executive Order 12549
Executive Order 12689

Contractor shall comply and facilitate compliance with U.S. DOT regulations, “Nonprocurement Suspension and Debarment,” 2 C.F.R. part 1200, which adopts and supplements the U.S. Office of Management and Budget (U.S. OMB) “Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement),” 2 C.F.R. part 180. These provisions apply to each contract at any tier of \$25,000 or more, and to each contract at any tier for a federally required audit (irrespective of the contract amount), and to each contract at any tier that must be approved by an FTA official irrespective of the contract amount. As such, Contractor shall verify that its principals, affiliates, and subcontractors are eligible to participate in this federally funded contract and are not presently declared by any Federal department or agency to be:

- a) Debarred from participation in any federally assisted Award;

- b) Suspended from participation in any federally assisted Award;
- c) Proposed for debarment from participation in any federally assisted Award;
- d) Declared ineligible to participate in any federally assisted Award;
- e) Voluntarily excluded from participation in any federally assisted Award; or
- f) Disqualified from participation in any federally assisted Award.

By signing and submitting its bid or proposal, the bidder or proposer certifies as follows:

The certification in this clause is a material representation of fact relied upon by Agency. If it is later determined by Agency that Contractor knowingly rendered an erroneous certification, in addition to remedies available to Agency, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment. The Contractor agrees to comply with the requirements of 2 C.F.R. part 180, subpart C, as supplemented by 2 C.F.R. part 1200, while this offer is valid and throughout

the period of any contract that may arise from this offer. The Contractor further agrees to include a provision requiring such compliance in its lower tier covered transactions.

CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The Contractor shall comply with all federal laws, regulations, and requirements providing wage and hour protections for non-construction employees, in accordance with 40 U.S.C. § 3702, Contract Work Hours and Safety Standards Act, and other relevant parts of that Act, 40 U.S.C. § 3701 et seq., and U.S. DOL regulations, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction (also Labor Standards Provisions Applicable to Non-construction Contracts Subject to the Contract Work Hours and Safety Standards Act)," 29 C.F.R. part 5.

The Contractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three (3) years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid.

Such records maintained under this paragraph shall be made available by the Contractor for inspection, copying, or transcription by authorized representatives of the FTA and the Department of Labor, and the Contractor will permit such representatives to interview employees during working hours on the job. The Contractor shall require the inclusion of the language of this clause within subcontracts of all tiers.

NOTIFICATION TO FTA AND U.S. DOT INSPECTOR OF INFORMATION RELATED TO FRAUD

Agency must promptly notify the U.S. DOT Inspector General in addition to the FTA Chief Counsel or Regional Counsel for the Region in which Agency is located, if Agency has knowledge of potential fraud, waste, or abuse occurring on a Project receiving assistance from FTA. The notification provision applies if a person has or may have submitted a false claim under the False Claims Act, 31 U.S.C. § 3729, *et seq.*, or has or may have committed a criminal or civil violation of law pertaining to such matters as fraud, conflict of interest, bid rigging, misappropriation or embezzlement, bribery, gratuity, or similar misconduct involving federal assistance.

This responsibility occurs whether the Project is subject to this Agreement or another agreement between Agency and FTA, or an agreement involving a principal, officer, employee, agent, or Third Party Participant of Agency.

It also applies to subcontractors at any tier. Knowledge, as used in this paragraph, includes, but is not limited to, knowledge of a criminal or civil investigation by a Federal, state, or local law enforcement or other investigative agency, a criminal indictment or civil complaint, or probable cause that could support a criminal indictment, or any other credible information in the possession of Agency. In this paragraph, "promptly" means to refer information without delay and without change. This notification provision applies to all divisions of Agency, including divisions tasked with law enforcement or investigatory functions.

**PROGRAM FRAUD AND FALSE OR FRAUDULENT STATEMENTS
AND RELATED ACTS**

**31 U.S.C. § 3801 *et seq.*
49 C.F.R Part 31
49 U.S.C. § 5307
18 U.S.C. §1001**

1. Contractor acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 U.S.C. § § 3801 *et seq.* and U.S. DOT regulations, "Program Fraud Civil Remedies," 49 C.F.R. Part 31, apply to its actions pertaining to this Project. Upon execution of the underlying Contract, Contractor certifies or affirms the truthfulness and accuracy of any statement it has made, it makes, it may make, or causes to be made, pertaining to the underlying Contract or the FTA assisted project for which this Contract work is being performed. In addition to other penalties that may be applicable, Contractor further acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification, the Federal Government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986 on Contractor to the extent the Federal Government deems appropriate.
2. Contractor also acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification to the Federal Government under a contract connected with a project that is financed in whole or in part with Federal assistance originally awarded by FTA under the authority of 49 U.S.C. § 5307, the Government reserves the right to impose the penalties of 18 U.S.C. § 1001 and 49 U.S.C. § 5307(n)(1) on Contractor, to the extent the Federal Government deems appropriate.
3. Contractor agrees to include the above two clauses in each subcontract financed in whole or in part with Federal assistance provided by FTA. It is further agreed that the clauses shall not be modified, except to identify the subcontractor who will be subject to the provisions.

LOBBYING RESTRICTIONS

**31 U.S.C. § 1352
2 C.F.R. § 200.450
2 C.F.R Part 200 Appendix II (I)
49 C.F.R Part 20**

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of Customer, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering A-48 into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of Customer, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

CERTIFICATION OF COMPLIANCE

The undersigned hereby agrees and certifies that Contractor will comply with and meet the requirements of all provisions set forth in the **31 U.S.C. § 1352, 2 C.F.R. § 200.450, 2 C.F.R Part 200 Appendix II(I)** and **49 C.F.R Part 20** provisions and all regulations referenced therein.

Signature of Contractor's Authorized Official: _____

Name and Title of Contractor's Authorized Official: _____

Date: _____

CIVIL RIGHTS REQUIREMENTS

**29 U.S.C. § 623, 42 U.S.C. § 2000
 42 U.S.C. § 6102, 42 U.S.C. § 12112
 42 U.S.C. § 12132, 49 U.S.C. § 5332
 29 C.F.R Part 1630, 41 C.F.R Parts 60 *et seq.***

In addition to obligations listed below, Contractor must also abide by all applicable State and local Civil Rights laws, statutes and ordinances.

The following requirements apply to this Contract:

1. **Non-Discrimination** - In accordance with Title VI of the Civil Rights Act, as amended, 42 U.S.C. § 2000d, section 303 of the Age Discrimination Act of 1975, as amended, 42 U.S.C. § 6102, section 202 of the Americans with Disabilities Act of 1990, 42 U.S.C. § 12132, and Federal transit law at 49 U.S.C. § 5332, Contractor agrees that it will not discriminate against any employee or applicant for employment because of race, color, creed, national origin, sex, age, or disability. In addition, Contractor agrees to comply with

applicable Federal implementing regulations and other implementing requirements FTA may issue.

2. **Equal Employment Opportunity** - The following equal employment opportunity requirements apply to the underlying Contract:

(a) Race, Color, Creed, National Origin, Sex - In accordance with Title VII of the Civil Rights Act, as amended, 42 U.S.C. § 2000e, and Federal transit laws at 49 U.S.C. § 5332, Contractor agrees to comply with all applicable equal employment opportunity requirements of U.S. Department of Labor (U.S. DOL) regulations, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor," 41 C.F.R. Parts 60 et seq ., (which implement Executive Order No. 11246, "Equal Employment Opportunity," as amended by Executive Order No. 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," 42 U.S.C. § 2000e note), and with any applicable Federal statutes, executive orders, regulations, and Federal policies that may in the future affect construction activities undertaken in the course of the Project. Contractor agrees to take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, creed, national origin, sex, or age. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. In addition, Contractor agrees to comply with any implementing requirements FTA may issue.

(b) Age - In accordance with section 4 of the Age Discrimination in Employment Act of 1967, as amended, 29 U.S.C. § § 623 and Federal transit law at 49 U.S.C. § 5332, Contractor agrees to refrain from discrimination against present and prospective employees for reason of age. In addition, Contractor agrees to comply with any implementing requirements FTA may issue.

(c) Disabilities - In accordance with section 102 of the Americans with Disabilities Act, as amended, 42 U.S.C. § 12112, Contractor agrees that it will comply with the requirements of U.S. Equal Employment Opportunity Commission, "Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act," 29 C.F.R. Part 1630, pertaining to employment of persons with disabilities. In addition, Contractor agrees to comply with any implementing requirements FTA may issue.

3. Contractor also agrees to include these requirements in each subcontract financed in whole or in part with Federal assistance provided by FTA, modified only if necessary to identify the affected parties.

DISADVANTAGED BUSINESS ENTERPRISE (DBE)

49 C.F.R. Part 26

Contractor, subrecipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. Contractor shall carry out applicable requirements of 49 C.F.R. part 26 in the award and administration of DOT-assisted contracts. Failure by Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as Agency deems appropriate, which may include, but is not limited to:

- (1) Withholding monthly progress payments;
- (2) Assessing sanctions;
- (3) Liquidated damages; and/or

(4) Disqualifying Contractor from future bidding as non-responsible. 49 C.F.R. § 26.13(b).

Further, recipients must establish a contract clause to require prime contractors to pay subcontractors for satisfactory performance of their contracts no later than 30 days from receipt of each payment Agency makes to the prime contractor. 49 C.F.R. § 26.29(a).

Finally, for contracts with defined DBE contract goals, each FTA recipient must include in each prime contract a provision stating that Contractor shall utilize the specific DBEs listed unless Contractor obtains Agency's written consent; and that, unless Agency's consent is provided, Contractor shall not be entitled to any payment for work or material unless it is performed or supplied by the listed DBE. 49 C.F.R. § 26.53(f)(1).

FEDERAL TAX LIABILITY AND RECENT FELONY CONVICTIONS

(1) Transactions Prohibited.

(i) Agency agrees that, prior to entering into any Third-Party Agreement with any private corporation, partnership, trust, joint-stock company, sole proprietorship, or other business association, Agency will obtain from the prospective Third-Party Participant a certification that the Third-Party Participant—

(A) Does not have any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability; and

(B) Was not convicted of the felony criminal violation under any Federal law within the preceding 24 months. 26 (ii) If the prospective Third-Party Participant cannot so certify, Agency agrees to refer the matter to FTA and not to enter into any Third-Party Agreement with the Third-Party Participant without FTA's written approval.

(2) Flow-Down. Agency agrees to require all Third-Party Participants to flow this requirement down to participants at all lower tiers, without regard to the value of any subagreement.

CERTIFICATION OF COMPLIANCE

The undersigned hereby agrees and certifies that Contractor will comply with and meet the requirements of all provisions set forth in the **Federal Tax Liability and Recent Felony Convictions** provisions and all regulations referenced therein.

Signature of Contractor's Authorized Official: _____

Name and Title of Contractor's Authorized Official: _____

Date: _____

STANDARDS OF CONDUCT RELATED TO CONFLICTS OF INTEREST

Contractor should at all times avoid the perception of or an actual conflict of interest as it relates the Agreement, including but not limited to the following:

1. Contractor shall not hold financial interests that conflict with the conscientious performance of duty.
2. Contractor shall not engage in financial transactions using nonpublic Customer information or allow the improper use of such information to further any private interest.
3. Contractor shall not solicit or accept any gift or other item of monetary value from any person or entity seeking official action from, doing business with, or conducting activities regulated by the Customer, or whose interests may be substantially affected by the performance or nonperformance of Contractor's duties, subject to very limited exceptions.
4. Contractor shall put forth honest effort in the performance of their duties.
5. Contractor shall not knowingly make unauthorized commitments or promises of any kind purporting to bind the Customer.
6. Contractor shall not use public office for private gain.
7. Contractor shall act impartially and not give preferential treatment to any private organization or individual.
8. Contractor shall protect and conserve Federal property and shall not use it for other than authorized activities.
9. Contractor shall not engage in outside employment or activities, including seeking or negotiating for employment, that conflict with Customer duties and responsibilities.
10. Contractor shall disclose waste, fraud, abuse, and corruption to appropriate authorities.
11. Contractor shall satisfy in good faith their obligations as citizens, including all just financial obligations, especially those—such as Federal, State, or local taxes—that are imposed by law.
12. Contractor shall adhere to all laws and regulations that provide equal opportunity for all Americans regardless of race, color, religion, sex, national origin, age, or disability.
13. Contractor shall endeavor to avoid any actions creating the appearance that they are violating the law or the ethical standards set forth in this part. Whether particular circumstances create an appearance that the law or these standards have been violated shall be determined from the perspective of a reasonable person with knowledge of the relevant facts.

SAFE OPERATION OF MOTOR VEHICLES

Contractor agrees:

Seat Belt Use. Contractor is encourages to adopt and promote on-the-job seat belt use policies and programs or its employees and other personnel that operate company-owned vehicles, company-rented vehicles, or personally operated vehicles. The terms “company-owned” and “company-leased” refer to vehicles owned or leased either by Contractor or Agency.

Distracted Driving. Contractor agrees to adopt and enforce workplace safety policies to decrease crashed caused by distracted drivers, including policies to ban text messaging while using an electronic devise supplied by Contractor, and driving a vehicle the driver owns or rents, a vehicle Contractor

owns, leases, or rents, or a privately-owned vehicle when on official business in connection with the work performed under this Agreement.

PREVENTION OF HUMAN TRAFFICKING

22 U.S.C. §7104(g)

2C.F.R. part 175

Contractor agrees that it and its employees that participate in recipient’s grant or funding award, may not:

Engage in severe forms of trafficking in persons during the period of time that Agency’s Award is in effect;

Procure a commercial sex act during the period of time that Agency’s Award is in effect; or

Use forced labor in the performance of Agency’s Award or subagreements thereunder.

STATEMENT OF COMPLIANCE

The undersigned hereby agrees and states that it has and will continue to comply with and meet the requirements of all provisions set forth in the **Prevention of Human Trafficking** provision and all regulations referenced therein.

Signature of Contractor's Authorized Official: _____

Name and Title of Contractor's Authorized Official: _____

Date: _____

CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

42 U.S.C. §§7401-7671q

33 U.S.C. §§1251-1388

2 C.F.R. part 200, Appendix II (G)

Contractor agrees:

(a) to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. §§ 7401, *et seq*, and the Federal Water Pollution Contract Act, as amended, 33 U.S.C. §§ 1251-1388. Contractor agrees to report each violation to Agency and understands and agrees that Agency will, in turn, report each violation to assure notification to the FTA and the appropriate EPA Regional Office.

(b) to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, the Federal Water Pollution Contract Act, as amended, 33 U.S.C. §§ 1251-1388. Contractor agrees to report each violation to Agency and understands and agrees that Agency will, in turn, report each violation to assure notification to the FTA and the appropriate EPA Regional Office. Contractor also agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with Federal Assistance provided by the FTA.

ENERGY CONSERVATION

42 U.S.C. § 6321 *et seq.*

Contractor agrees to comply with mandatory standards and policies relating to energy efficiency, which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.

PUBLIC TRANSPORTATION EMPLOYEE PROTECTIVE ARRANGEMENTS

Contractor agrees to comply with the following employee protective arrangements of 49 U.S.C. § 5333(b):

1. **U.S. DOL Certification.** Under this Contract or any Amendments thereto that involve public transportation operations that are supported with federal assistance, a certification issued by U.S. DOL is a condition of the Contract.

2. **Special Warranty.** When the Contract involves public transportation operations and is supported with federal assistance appropriated or made available for 49 U.S.C. § 5311, U.S. DOL will provide a Special Warranty for its Award, including its Award of federal assistance under the Tribal Transit Program. The U.S. DOL Special Warranty is a condition of the Contract.
3. **Special Arrangements.** The conditions of 49 U.S.C. § 5333(b) do not apply to Contractors providing public transportation operations pursuant to 49 U.S.C. § 5310. FTA reserves the right to make case-by-case determinations of the applicability of 49 U.S.C. § 5333(b) for all transfers of funding authorized under title 23, United States Code (flex funds), and make other exceptions as it deems appropriate, and, in those instances, any special arrangements required by FTA will be incorporated herein as required.

ACCESS REQUIREMENTS FOR PERSONS WITH DISABILITIES

Contractor shall comply with 49 U.S.C. § 5301(d), stating Federal policy that the elderly and persons with disabilities have the same rights as other persons to use mass transportation services and facilities and that special efforts shall be made in planning and designing those services and facilities to implement that policy. Contractor shall also comply with all applicable requirements of Sec. 504 of the Rehabilitation Act (1973), as amended, 29 USC 794, which prohibits discrimination on the basis of handicaps, and the Americans with Disabilities Act of 1990 (ADA), as amended, 42 USC 12101 et seq., which requires that accessible facilities and services be made available to persons with disabilities, including any subsequent amendments thereto.

RECYCLED PRODUCTS

**49 C.F.R. part 247
2 C.F.R. part 200.322**

Contractor agrees to provide a preference for those products and services that conserve natural resources, protect the environment, and are energy efficient by complying with and facilitating compliance with Section 6002 of the Resource Conservation and Recovery Act, as amended, 42 U.S.C. § 6962, and U.S. Environmental Protection Agency (U.S. EPA), "Comprehensive Procurement Guideline for Products Containing Recovered Materials," 40 C.F.R. part 247.

SUBSTANCE ABUSE REQUIREMENTS

**49 U.S.C. § 5331
49 C.F.R. part 655
49 C.F.R. part 40**

Contractor agrees to establish and implement a drug and alcohol testing program that complies with 49 C.F.R. parts 655, produce any documentation necessary to establish its compliance with part 655, and permit any authorized representative of the United States Department of Transportation or its operating administrations, the State Oversight Agency of Indiana, to inspect the facilities and records associated with the implementation of the drug and alcohol testing program as required under 49 C.F.R. part 655 and review the testing process. Contractor agrees further to certify annually its compliance with parts 655 before and to submit the Management Information System (MIS) reports before to the Human Resource Director at Bloomington Public Transit Corporation. To certify compliance, Contractor shall use the "Substance Abuse Certifications" in the "Annual List of Certifications and Assurances for Federal Transit Administration Grants and Cooperative Agreements," which is published annually in the Federal Register.

PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SERVEILLANCE SERVICES OR EQUIPMENT

48 C.F.R. § 52.204-25

Contractor is prohibited from obligating or expending Federal funds to:

- a) Procure or obtain;
- b) Expend or renew a contract to procure or obtain; or
- c) Enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.
- d) As described in Public Law 115-232, Section 889, "covered telecommunications equipment or services" is: Telecommunications equipment produced by Huawei Technologies Company or ZTA Corporation (or any subsidiary or affiliate of such entities).
- e) For public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hanzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
- f) Telecommunications or video surveillance services provided by such entities or using such equipment.
- g) Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of National Intelligence or other Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.
- h) Contractor shall not provide covered telecommunications equipment or services in the performance of this contract.

CARGO PREFERENCE

46 U.S.C. § 55305

46 C.F.R. part 381

Use of United States Flag Vessels, Contractor agrees:

- a) To use privately owned United States-Flag commercial vessels to ship at least fifty (50) percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this Agreement to the extent such vessels are available at fair and reasonable rates for the United States-Flag commercial vessels.
- b) To furnish within twenty (20) working days following the date of loading for shipments originating within the United States or within thirty (30) days following the date of loading for shipments originating outside the United States, a legible copy of a rated, "on-board" commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (a) to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington D.C. 20590 and the FTA recipient (through Contractor in the case of a subcontractor's bill-of-lading.)
- c) To include these requirements in all subcontracts issued pursuant to this Agreement when the subcontract may involve the transport of equipment, material, or commodities by ocean vessel.

FLY AMERICA

49 U.S.C. § 40118

41 C.F.R. Part 301-10

48 C.F.R. Part 47.4

Contractor agrees to comply with 49 U.S.C. § 40118 (the "Fly America" Act) in accordance with the General Services Administration's regulations at 41 C.F.R. § 201-10.131 through 301-10.143, which provide that recipients and sub-recipients of Federal funds and their consultants are required to use U.S. Flag Air carriers for U.S. Government-financed international air travel by foreign air carrier is a matter of necessity, as defined by the Fly America Act. Contractor shall submit, if a foreign air carrier was used, an appropriate certification or memorandum adequately explaining why service by a U.S. flag air carrier was not available or why it was necessary to use a foreign air carrier and shall, in any event, provide a certificate of compliance with the Fly America requirements. Contractor agrees to include the requirements of this section in all subcontracts that may involve international air transportation.

PROCUREMENT OF RECOVERED MATERIALS

A non-Federal entity that is a state agency or agency of a political subdivision of a state and its contractors must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds \$10,000 or the value of the quantity acquired during the preceding fiscal year exceeded \$10,000; procuring solid waste management services in a manner

that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines. In the performance of this contract, the Contractor shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired—Competitively within a timeframe providing for compliance with the contract performance schedule; Meeting contract performance requirements; or at a reasonable price. Information about this requirement, along with the list of EPA-designate items, is available at EPA's Comprehensive Procurement Guidelines web site, <https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program>

PROMPT PAYMENT

The Contractor is required to pay its subcontractors performing work related to this contract for satisfactory performance of that work no later than thirty (30) days after the Contractor's receipt of payment for that work. In addition, the Contractor is required to return any retainage payments to those subcontractors within thirty (30) days after the subcontractor's work related to this contract is satisfactorily completed. The contractor must promptly notify the Agency, whenever a DBE subcontractor performing work related to this contract is terminated or fails to complete its work and must make good faith efforts to engage another DBE subcontractor to perform at least the same amount of work. The Contractor may not terminate any DBE subcontractor and perform that work through its own forces or those of an affiliate without prior written consent of the Agency. The following clauses will be incorporated into any contract arising from this competitive procurement: *The prime contractor is required to pay each subcontractor under this contract for satisfactory performance of its contracts no later than thirty (30) days from receipt of each payment received by the prime contractor from Citilink. Any delay or postponement of payment between prime and subcontractors may take place only for good cause, and with Citilink's prior written approval. Citilink will establish, as part of the contract between the Prime Contractor and Citilink, a schedule of values detailing the project activities and timelines for work performed by the GC and all subcontractors. Retainage release payments will be established based upon this schedule of values. The prime contractor must return retainage payments to each subcontractor within 30 days after the subcontractors' work is satisfactorily completed. Any delay or postponement of payment between prime and subcontractors may take place only for good cause, and with Citilink's prior written approval. Citilink will monitor all payment schedules for inclusion of work performed by subcontractors. Citilink will contact, at random, subcontractors to ensure that payments for satisfactory completed work have been received. If an occurrence is found in which a subcontractor was not paid by the Prime, the prime contractor will not be reimbursed for work performed by subcontractors, unless and until the prime contractor pays the subcontractors and ensures that the subcontractors continue to be promptly paid for work performed. If a prime contractor determines subcontractor work to be unsatisfactory, it must notify Citilink immediately, in writing, and state the reasons. Failure to comply with this requirement will be construed to be a breach of contract and subject to contract termination.*

APPENDIX A: GLOSSARY OF TERMS

AJAX	Asynchronous JavaScript and XML
AP	Access Point
APC	Automatic Passenger Counter
API	Application Program Interface
AVA	Automatic Voice Annunciation
AVL	Automatic Vehicle Location
C	Celsius
CAD	Computer Aided Dispatch
CAL	Client Access License
CFA	Core First Article
CITS	Citilink Intelligent Transportation System
DC	Direct Current
DMS	Document Management System
DXF	Drawing Exchange Format
EIA	Electronic Industries Association
EOL/EOS	End of Life/End of Support
F	Fahrenheit
FAT	Factory Acceptance Test
FM	Frequency Modulation
FTA	Federal Transportation Administration
GIS	Geographic Information System
GPS	Global Positioning System
GTFS	General Transit Feed Specification
GUI	Graphical User Interface
ID	Identification
IEEE	Institute of Electrical and Electronics Engineers

IP	Internet Protocol
ISO	International Standards Organization
IT	Information Technology
ITS	Intelligent Transportation System
JSON	JavaScript Object Notation
KVM	Keyboard, Video, and Mouse
LAN	Local Area Network
MDT	Mobile Data Terminal
MIL-STD	Military-Standard
NTCIP	National Transportation Communications for ITS Protocol
NTD	National Transit Database
OBDC	Open Database Connectivity
OSI	Open Systems Interconnection
PA	Public Address
PRTT	Priority Request To Talk
PTT	Push to Talk
PSA	Public Service Announcement
QA	Quality Assurance
RAM	Random Access Memory
RF	Radio Frequency
RFI	Radio Frequency Interference
RH	Relative Humidity
RMA	Return Merchandise Authorization
RMS	Root Mean Squared
RTT	Request to Talk
SAE	Society of Automotive Engineers
SAN	Storage Area Network
SAS	Silent Alarm System
SMS	Short Message Service

SPE	Senior Project Engineer
SQL	Structured Query Language
TCIP	Transit Communications Interface Profiles
UPS	Uninterruptible Power Supply
URL	Uniform Resource Locator
USB	Universal Serial Bus
WAN	Wide Area Network
WLAN	Wireless Local Area Network
XML	Extensible Markup Language