



**DRAFT REQUEST FOR PROPOSALS (RFP)**  
**SRTA SOLICITATION # 23-000**

**STATE ROAD AND TOLLWAY AUTHORITY (SRTA)**  
**TOLL INTEGRATION SERVICES CONTRACTOR (TISC)**

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## **PART 1 – SOLICITATION AND SELECTION**

This section will be included with the final RFP.

## PART 2 – SCOPE OF WORK

### 1 Project Overview

The SRTA intends to award a Toll Integration Services Contractor (TISC) contract to secure products and services for the design, project management, implementation, testing, installation, integration, training, operations, and maintenance of an Electronic Toll Collection System (ETCS) for SRTA's existing toll facilities (Project).

The goals of the TISC contract are as follows:

1. Achieve operational cost efficiencies through the application of innovation, technology, and industry best practices.
2. Meet or exceed schedule and performance targets during design and implementation as well as throughout the operations and maintenance phase.
3. Safely and smoothly transition the existing Toll System Integrator (TSI) toll facilities and ITS system to the responsibility of the TISC with minimal revenue loss and disruptions to customers.
4. Reduce the level of software customization and development required by conducting a thorough discovery process of SRTA's needs, developing an understanding of the TISC's core software platform offerings, and modifying technical requirements to best leverage the TISC's core offerings with cost-effective enhancements that meet SRTA's needs.
5. Cooperate and collaborate productively with SRTA and its project stakeholders.
6. Provide a seamless and quality customer experience throughout SRTA's Express Lane facilities.

SRTA, in partnership with the GDOT, develops, operates, and maintains Georgia's Express Lane network. SRTA is responsible for setting toll rates, collecting tolls, and managing the Peach Pass Customer Service Center (CSC). GDOT is responsible for civil construction of each Express Lane facility when applicable. SRTA is responsible for the toll system implementation and maintenance on each facility. SRTA collaborates with GDOT throughout the concept, implementation, and operational phases of Express Lane projects.

SRTA currently operates four toll facilities around metro Atlanta: I-85 Express Lanes, I-85 Extension Express Lanes, I-75 South Metro Express Lanes, and the Northwest Corridor Express Lanes, which herein will be referred to as I-85A, I-85B, I-75A and I-75B respectively. These dynamically priced lanes run alongside existing interstates in some of the most congested corridors in the region. The existing toll facilities provide a choice for motorists and transit riders who want a more reliable travel option during peak periods. Each lane is congestion priced to maintain reliable travel times during the peak traffic periods. In the context of this RFP, congestion pricing covers both Time-Of-Day (TOD) and Dynamic Pricing (i.e., tolling rates tied to a traffic metric such as speed or density).

#### 1.1 I-85 Facilities Overview

The toll facility on I-85 is composed of two separate toll systems, the I-85 Express Lanes (I-85A) and the I-85 Extension Express Lanes (I-85B).

I-85A is a 15-mile High Occupancy Toll (HOT) facility from Chamblee Tucker Road in DeKalb County to North of Old Peachtree Road in Gwinnett County, including a two-mile stretch of SR 316. The HOT facility has a single HOT lane in each direction and is separated from the adjacent General Purpose (GP) lanes by a painted double white line buffer. There are several entry and exit points along the corridor. I-85A opened



on September 30, 2011, as a conversion of the existing High Occupancy Vehicle (HOV) lanes. Refer to Figure 2 for a map of the I-85A corridor.

I-85B consists of 10 miles of additional capacity with one HOT lane in each direction along I-85 in north Metro Atlanta. It connects to the I-85A just north of Old Peachtree Road extending to Hamilton Mill Road, all within Gwinnett County. These managed lanes opened to traffic in November 2018 and operate under the same occupancy and eligibility business rules as the I-85A. However, each facility is priced independently, and transactions on the two facilities are built into separate trips (i.e., no single trip will span both facilities). Refer to Figure 3 for a map of the I-85B corridor.

Occupancy declaration is currently handled as an account status in the Commercial Back Office (CBO). SRTA does not use in-lane equipment or switchable tags for occupancy declaration.

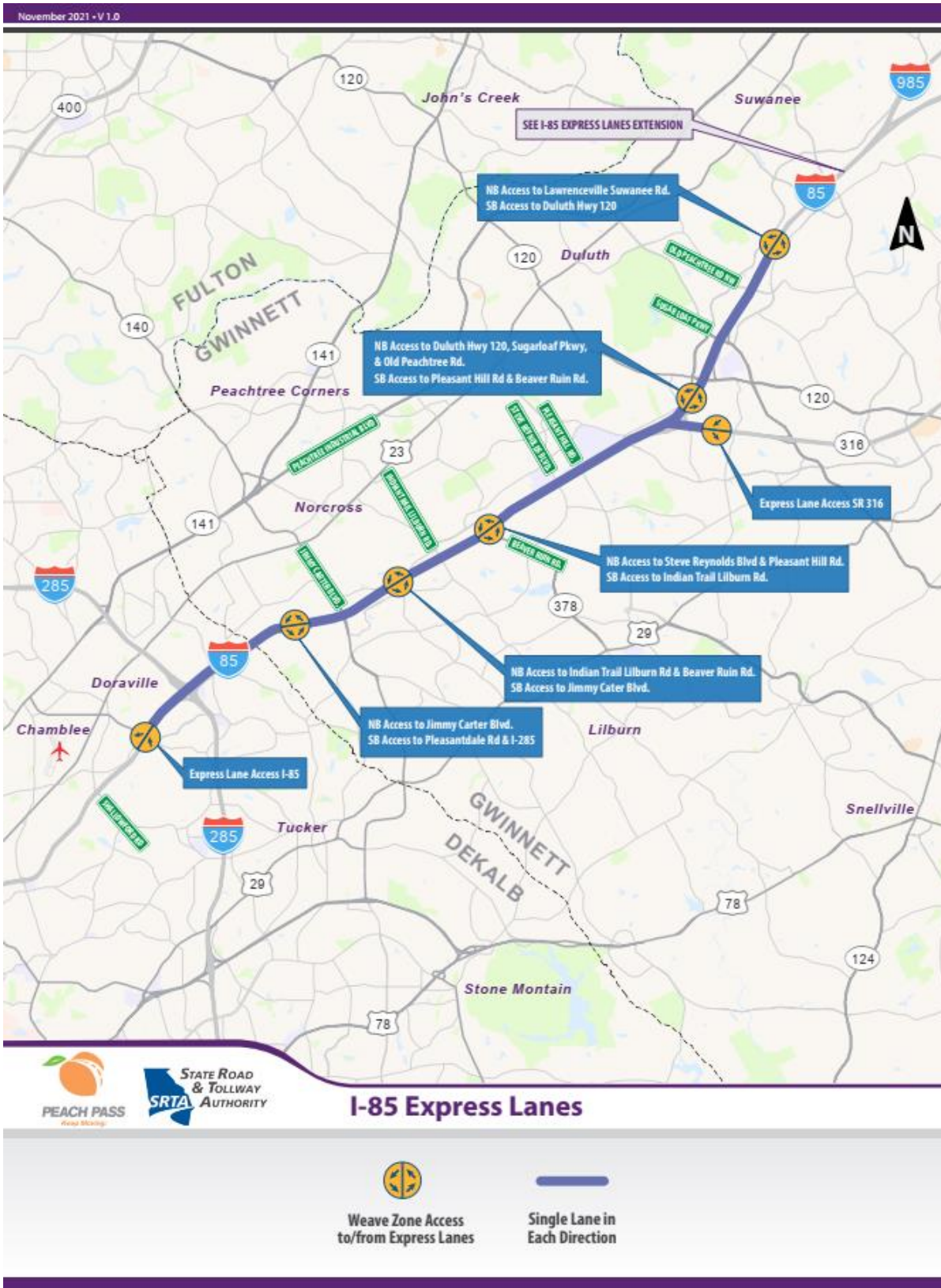


Figure 1: I-85 Express Lanes Entry and Exit Diagram (I-85A)



Figure 2: I-85 Express Lanes Extension Entry and Exit Diagram (I-85B)

## 1.2 I-75 Facilities Overview

The toll facility on I-75 is currently composed of two separate toll systems, the 75 South Metro Express Lanes (I-75A) and the Northwest Corridor Express Lanes (I-75B).

I-75A consists of reversible, barrier-separated toll lanes with several entrance and exit points that run 12 miles along the median of I-75 from McDonough Road (State Route 155) in Henry County to Stockbridge Highway (State Route 138) in Clayton County. The lanes opened in January 2017 and operate northbound in the morning and southbound in the evening. Refer to Figure 4 for a map of the I-75A corridor.

I-75B consists of a reversible, barrier-separated toll lane system that runs 29.7 miles along the I-75 corridor from Akers Mill Road to Hickory Grove Road and along I-575 from I-75 to Sixes Road. Two Express Lanes were built to the west of the existing lanes along I-75 between I-285 and I-575. From that interchange, one express lane was added along I-75 within the median north to Hickory Grove Road and one express lane was added along I-575 within the median to Sixes Road. There are several entry and exit points along the corridor. The reversible Express Lanes opened to traffic in September 2018 and operate southbound in the morning and northbound in the evening. Refer to Figure 5 for a map of the I-75B corridor.

For the existing toll facilities on I-75, GDOT is responsible for determining the direction of the roadway and operating the GDOT ATMS Roadway Access Control System (RACS) gates and signs. GDOT's ATMS and SRTA's ETCS system communicate via an interface that enables the RACS to communicate to the ETCS the direction of travel of the Facilities set by the GDOT TMC. GDOT's system sends the commands that initiate an operational reversal sequence. SRTA's system acknowledges receipt of the command and follows the workflows for that sequence of activities.





Figure 3: I-75 South Metro Express Lanes Overview Map (I-75A)

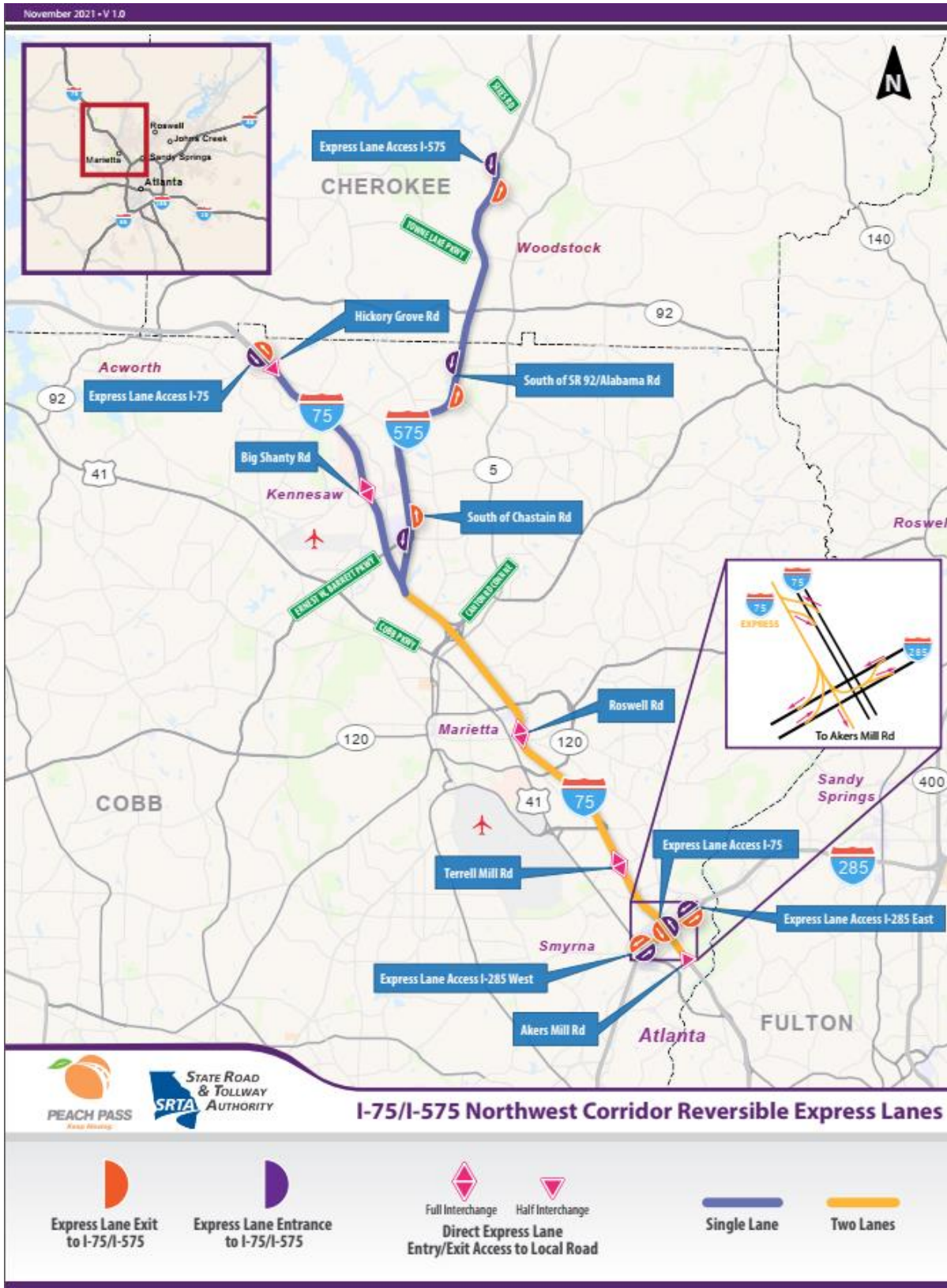


Figure 4: Northwest Corridor Express Lanes Overview Map (I-75B)

### 1.3 General Description of Scope of Work

The TISC will provide an ETCS that includes a Toll Facility Host (TFH) and Roadside Equipment for the existing I-85 and I-75 Express Lane facilities. The Roadside Equipment will include, but is not limited to toll points, toll rate dynamic message signs (TRDMS), CCTV, traffic sensors, emergency generators, and travel time readers. TFH will include such functionality as trip building, congestion pricing, image processing, reporting, auditing, and interfacing with SRTA and third-party systems. The TISC will be responsible for all aspects of system design, project management, testing, installation, implementation, integration, training, operations and maintenance as relates to the existing toll facilities. During the operations and maintenance phase, the TISC will be responsible for maintaining and enhancing the system and extracting accurate license plate information for the captured transactions.

The TISC is required to develop and execute a SRTA-approved Transition Plan for the existing I-85 and I-75 toll facilities. While each toll facility consists of a pair of toll roads that calculate tolls based on vehicle trips, the business rules for trip building are significantly different. I-75 trips are determined by entry and exit toll transactions, while I-85 trips are determined by zones traversed. The TISC TFH will create fully rated trips from both facilities and post them to the CBO in accordance with the published ICD. The CBO will post trips to Peach Pass accounts, violation accounts, and interoperable agencies.

The Transition Plan will describe the detailed approach to transitioning the existing TFH and roadside systems to the new TISC TFH and roadside systems. At the completion of the TISC TFH transition, the TISC TFH will Go Live, becoming the system of record for revenue collection for the SRTA toll facilities. Initially, the TISC TFH will accept and process transactions from the TSI toll points into trips using a converter to translate legacy transactions to TISC transactions. As individual TSI toll points are transitioned to TISC toll points, the TFH will form trips using a mix of legacy and TISC toll point transactions. When all of the toll points in both roads in a facility have been converted to TISC toll points, an Operational Acceptance Test (OAT) will be conducted to verify the facility is operating in compliance with its functional and performance requirements. The transition of the second facility will follow the same process. A Transition Plan developed by the TISC shall describe the process and testing needed to complete the TFH transition.

The TISC is to provide an ETCS that includes the following functionality:

#### **1. Roadside Equipment**

- a. Roadside systems and infrastructure to support Automatic Vehicle Identification (AVI), Automated Vehicle Detection and Classification (AVC), Video Toll System (VTS), Digital Video Audit System (DVAS), traffic sensors, and all related/required components and sensors.
- b. CCTV cameras and viewing/recording system for traffic surveillance, transaction auditing, and TRDMS monitoring.
- c. TRDMS for posting toll rates.
- d. AVI readers for travel time measurement.
- e. Traffic sensor sites.
- f. Network design, implementation, maintenance, and the ability to monitor availability as necessary to provide a system that meets all Service Level Agreements (SLAs) of the Contract.

#### **2. TFH**

- a. User interface(s) and applications (e.g., TRDMS Video review, Congestion Pricing GUI, ETCS Reversal) for SRTA TOC staff to utilize during daily operations to manage toll rates on the Express Lane(s).
- b. Processing, tracking, and storing of all transactions generated by roadside tolling Equipment.

- c. Trip building system to create trips based on SRTA's business rules.
- d. Image processing and audit system to output a license plate result to be used in trip building.
- e. Congestion Pricing System (CPS) to calculate and provide toll rates based on traffic conditions such as vehicle speed and/or volume in the General-Purpose lanes and/or the Express Lanes.
- f. Time of Day toll rate plan scheduling.
- g. Comprehensive reporting and dashboard system that allows the user to export reports or create custom ad-hoc views, reports, dashboards, or visualizations.
- h. Maintenance Online Monitoring System (MOMS) that includes work order creation, dashboards, inventory tracking, and communication of configurable alerts/alarms to SRTA TOC and other staff.
- i. Monitoring of all toll zones for system status from all lane level equipment along with processing activities (transactions being formed), and direction of traffic alerts for reversible facilities.
- j. Processing single or "orphaned" transactions into trips by way of "Transaction Matching" logic and algorithms.
- k. Reconciling, auditing, and reporting all transactions and trips.
- l. User interface for TOC Operators to manage and interact with the ETCS.
- m. TOC workstations equipment and installation.
- n. Interface with the CBO (per the SRTA provided ICD) for transmission and reconciliation of trips, and for receipt of Transponder Validation Lists (TVL) and other files.
- o. Interface with the GDOT ATMS to allow for roadway reversal.
- p. Interface with the SRTA Data Warehouse for transmittal of specific datasets from the TISC's database.
- q. Managed and Tolloed Lane Feed Specification Interface to provide information and data on the Express Lanes network for third parties to use in mobile and web app development.

Additional and more detailed requirements for these systems, subsystems, and required services are described in the sections of the RFP that follow.

## 1.4 Project Partnerships and Responsibilities

During the Execution of this Project, the TISC shall be required to interact and coordinate with various entities and stakeholders to meet the requirements in this RFP. Figure 5 is a high-level diagram of the different parties involved and respective responsibilities. SRTA is partnered with GDOT for the delivery of new Express Lanes and operations of the existing Express Lanes system.

SRTA is responsible for oversight and management of the toll system operation, CBO, and TSI(s). Currently SRTA contracts with Kapsch for its CBO where account management, violation processing, payment processing, and customer service applications are handled. The TISC will be interfacing with the CBO through the STI ICD to send fully formed and rated trips to the CBO.

SRTA currently contracts with two existing roadside toll system integrators (TSI) that maintain the two toll facility pairs, I-85A/B and I-75A/B. The TISC is required to coordinate with the Legacy TSIs, ETC and Neology, to transition the existing TSI toll facilities as described in this RFP. SRTA Operations are the end users of the ETCS. SRTA's Engineering & Delivery division is responsible for the overall delivery of the Project. SRTA Operations will be operating and managing the Contract once System Acceptance occurs for a toll facility pair. The TISC is required to coordinate with SRTA Operations through the entirety of the Contract to ensure that end user needs are met.

The TISC is also required to coordinate with SRTA IT, which manages the SRTA Security Policies. They also manage the Metropolitan Area Network (MAN) that the TISC will connect to its roadside network for



access to SRTA's network as well as the cloud network for the TFH. SRTA IT manages user creation and updates for SRTA as well as the management of SRTA's Data Warehouse that the TISC is required to interface with.

It is important to note that as part of SRTA's partnership with GDOT, GDOT may be involved in reviews and meetings related to structures they own, maintain or are shared with SRTA, related to shared electrical and fiber communication, any TMC work, any work at the network communication hubs, and meetings for lane or shoulder closures. SRTA, at its sole discretion, is responsible for determining any required coordination with GDOT throughout the duration of the TISC contract. The TISC is required to attend and participate in any GDOT meetings at SRTA's request throughout the duration of the TISC contract.

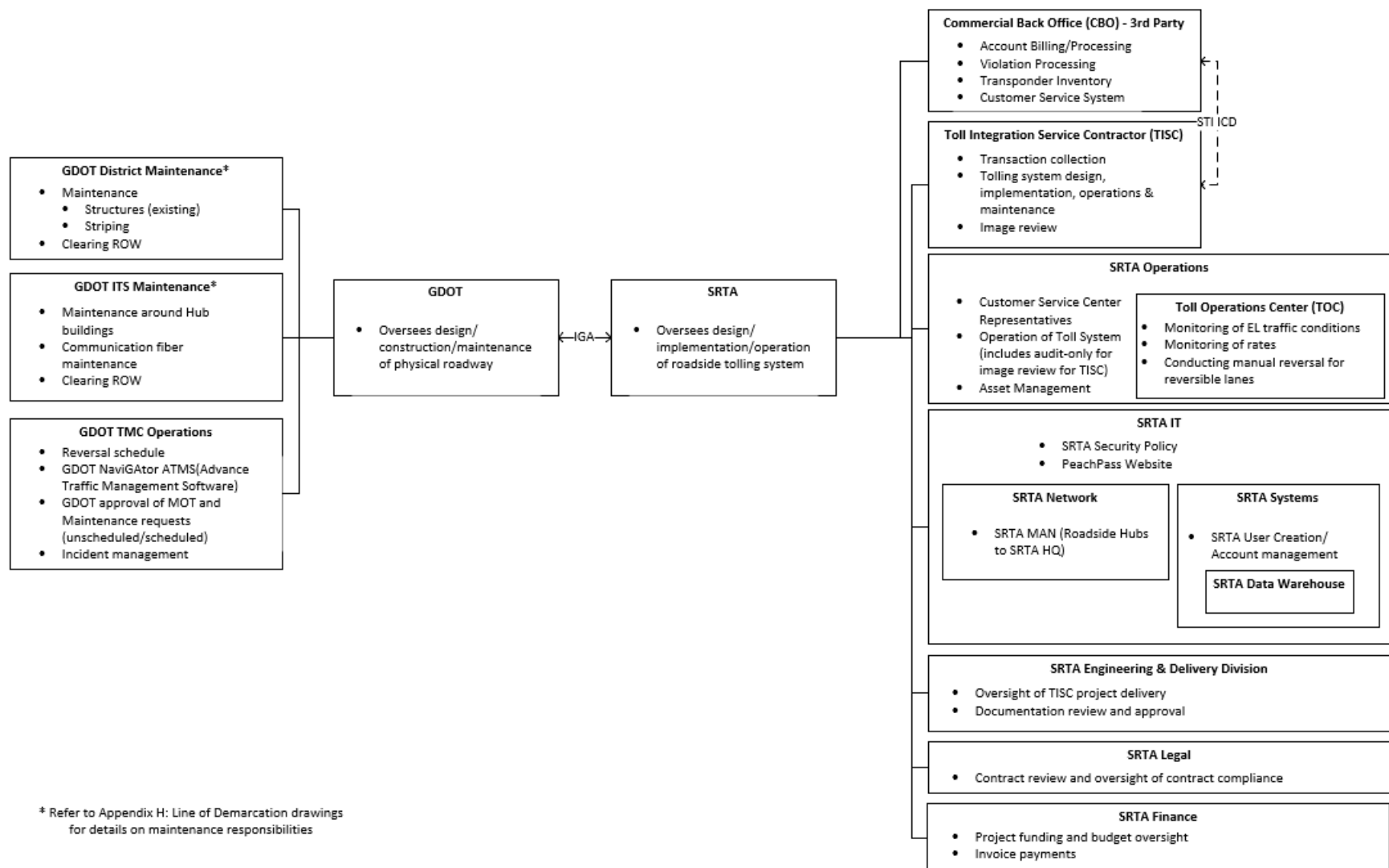


Figure 5: High-Level Diagram of Project Partnerships and Responsibilities

## 2 ETCS Requirements

The following sections detail the requirements for the ETCS system and installation.

### 2.1 Roadside System Requirements

#### 2.1.1 General Roadside Hardware Requirements

The following describes the general roadside equipment requirements:

No.	General Roadside Hardware Requirements
	The TISC shall select ETCS components (e.g., hardware, equipment, support structures, etc.) appropriate for operation in the installed site environment and available infrastructure.
	The TISC shall be responsible for procuring and replacing all spare parts at no additional cost to SRTA with the exception of approved force majeure incidents.
	<p>The TISC shall provide all hardware and equipment per the GDOT Quality Products List (QPL) at the time of procurement.</p> <p>This list can be accessed at the following website: <a href="https://www.dot.ga.gov/PartnerSmart/Materials/Documents/qpl48.pdf">https://www.dot.ga.gov/PartnerSmart/Materials/Documents/qpl48.pdf</a></p> <p>Equipment that is not covered by the GDOT QPL, shall be clearly identified, submitted to SRTA, and reviewed and approved during the design phase of the tolling system.</p>
	The TISC shall ensure all zone controllers are identical in form, fit, and function.
	All equipment and hardware shall be supportable and maintainable for at least 7 years.
	All equipment shall be field proven devices.
	All equipment/devices proposed for this Project will be identical to the equipment used during the Factory Acceptance Test.
	Any equipment used for the Factory Acceptance Test will not be reused for the Project implementation.
	ETCS equipment and devices not in environmentally controlled conditions shall operate with no degradation of performance in ambient air temperature of -10°C to 120°C, with and without direct sunlight, and a relative humidity range of 5% to 95%, non-condensing.
	ETCS equipment and devices not in environmentally controlled conditions shall operate without degradation in all weather conditions including rain, snow, fog and wind.

#### 2.1.1.1 Maintainability

The following details the maintainability requirements for the roadside systems:

No.	Maintainability Requirements
	The TISC shall design the ETCS to allow for efficient installation and maintainability to minimize downtime for device replacement, adjustments, and tuning.
	All equipment shall be installed in a manner that does not require specialized tools.
	The TISC shall ensure all replacement parts and units for zone controllers are modular and can be changed out with no equipment modification required.
	All equipment shall be installed as to not create a safety hazard while maintaining and/or during removal and replacement procedures.

#### 2.1.1.2 Diagnostics

The following details the requirements for the ETCS diagnostic capabilities:

No.	Diagnostics Requirements
	The TISC shall supply Diagnostic Software and any specialty tools required for support of the ETCS.
	SRTA will have full rights and access to any and all Diagnostic software and specialty tools.
	The TISC shall perform automated routine diagnostics on all in-lane peripherals and in-lane subsystems.
	All diagnostics performed by the TISC shall be recorded and automatically reported to the MOMs.
	Notification to MOMs shall include technician identification, time of action, and all system generated messages as a result of the action.

#### 2.1.2 Roadside Installation Requirements

The following are the requirements for roadside installation of the ETCS:

No.	Requirement
	The TISC shall supply all required installation personnel, tools, materials, equipment, and traffic control devices.
	The TISC shall install all components manufactured/provided by any third parties in accordance with the manufacturer's installation instructions.
	The TISC shall arrange on-site and remote support services, as needed, from third-party vendor(s) for proper installation and operation of equipment at no additional cost to SRTA.
	The TISC shall be responsible for procuring and installing any additional infrastructure that may be required to operate and maintain the ETCS.
	The TISC shall submit in writing any changes to existing infrastructure to SRTA for approval.

No.	Requirement
	The TISC shall be responsible for licensing, providing, installing, configuring, testing, and maintaining the proposed ETCS software and any supporting software (i.e., operating system, drivers, networks, databases, monitoring) on all proposed computers, workstations, and servers.
	To minimize the impact to existing operations, the TISC shall coordinate with SRTA to determine work to be done during business hours and work to be conducted afterhours or on weekends.
	The TISC shall design, procure, install, configure, and test all hardware, equipment, and communications of the ETCS.
	The TISC shall mobilize and secure any required facilities necessary to facilitate installation and maintenance efforts.
	The TISC shall be responsible for coordinating all installation Work with SRTA.
	Electrical work shall be performed by electricians licensed in the State.
	The TISC shall use a GDOT preferred licensed vendor for any electrical work required or planned for at the TMC.
	All connectors and wiring must be clearly labeled using a method and materials that will endure local environmental conditions as well as normal use.
	The TISC shall be responsible for all costs associated with obtaining necessary permits, licenses, plan reviews, and inspections.
	The TISC shall be responsible for setting up and removal of the various worksites, storage areas, sanitary, and other facilities necessary for the installation work as required by local law, rules, regulations, and ordinance mandates.
	The TISC shall be responsible for all communication and power between the toll devices and the toll equipment cabinet.
	The TISC system shall interface with the generators by MODBUS and validate successful start-up and full functionality of the generators, including: Testing of the automatic transfer switches, Testing shut down of main power at related toll points for automatic switch to generator power and receiving/handling diagnostic data from the generators (See Appendix F: Line of Demarcation Drawings).
	The TISC shall be responsible for validating available utility power and load capacities at all locations, as well as for any required changes to available power at the distribution panel (additional breakers, change to breaker size, etc.). The TISC must submit request for approval to SRTA for any changes prior to implementing.
	The TISC shall rekey all toll equipment cabinets and provide new locks at each fence gate for all facilities.
	The TISC shall submit changes to new or existing infrastructure to SRTA for approval.

### 2.1.2.1 Existing Facilities

The following Appendices included with the RFP provide a good overview and additional information regarding the existing Roadside installations:

- 1) Appendix B – Single Line Diagrams.
- 2) Appendix C – Existing Infrastructure.
- 3) Appendix F – Line of Demarcation Drawings.

Existing devices, equipment, and infrastructure are either eligible for re-use, required for re-use, or ineligible for re-use as identified in these requirements. Appendix C: Existing Infrastructure provides a detailed tables of the last known equipment manufacturer, part and model numbers, and installation date.

The following sections provide details of existing devices, equipment, and infrastructure per site type as well as eligibility for re-use, sites to be decommissioned, and sites to be modified.

Devices, equipment, or infrastructure not listed in the re-use tables will be the responsibility of the TISC.

#### 2.1.2.1.1 Existing SRTA Network and Equipment Hubs

The SRTA ETCS communication network infrastructure consists of the following layers:

##### **Layer 1:**

- Backbone trunk (between hubs) and lateral (from backbone to cabinet) conduit systems.
- Backbone trunk and lateral fiber optic cable communication systems.
- Fiber optic cable termination and patch panel distribution.

##### **Layer 2:**

- Toll system network equipment (i.e., switches, GBICs/SFPs, routers, etc.).

##### **Layer 3:**

- Toll network backbone communications infrastructure (i.e., core switches).
- WAN Connectivity.

The TISC will be required to re-use all the existing Layer 1 infrastructure for each transitioned site on the existing facilities.

Each facility has a trunk fiber which runs between two communication network Hub buildings and terminates at the Fiber Distribution Units (FDUs) inside the buildings. Each toll equipment cabinet is equipped with a Fiber Patch Panel (FPP) with a 12-Strand Single-mode (SM) lateral service drop that is spliced into a facility trunk fiber. The lateral fiber includes lit fibers currently in use by the legacy system as well as spare fibers spliced into spare backbone fibers. Attachment 3: Existing As-Built includes fiber splice details for each existing facility and schematics that detail the network communication from each facility to the SRTA HQ and TOC. The communication connection from each existing facility to the SRTA HQ and TOC occurs through GDOT's MAN infrastructure. Internet connectivity to select hubs for cloud connections and vendor maintenance is provided by current TSI.

The logical organization of the communication network showing the relationships between the various Hub sites and the TMC and SRTA HQ is shown in **Error! Reference source not found..**

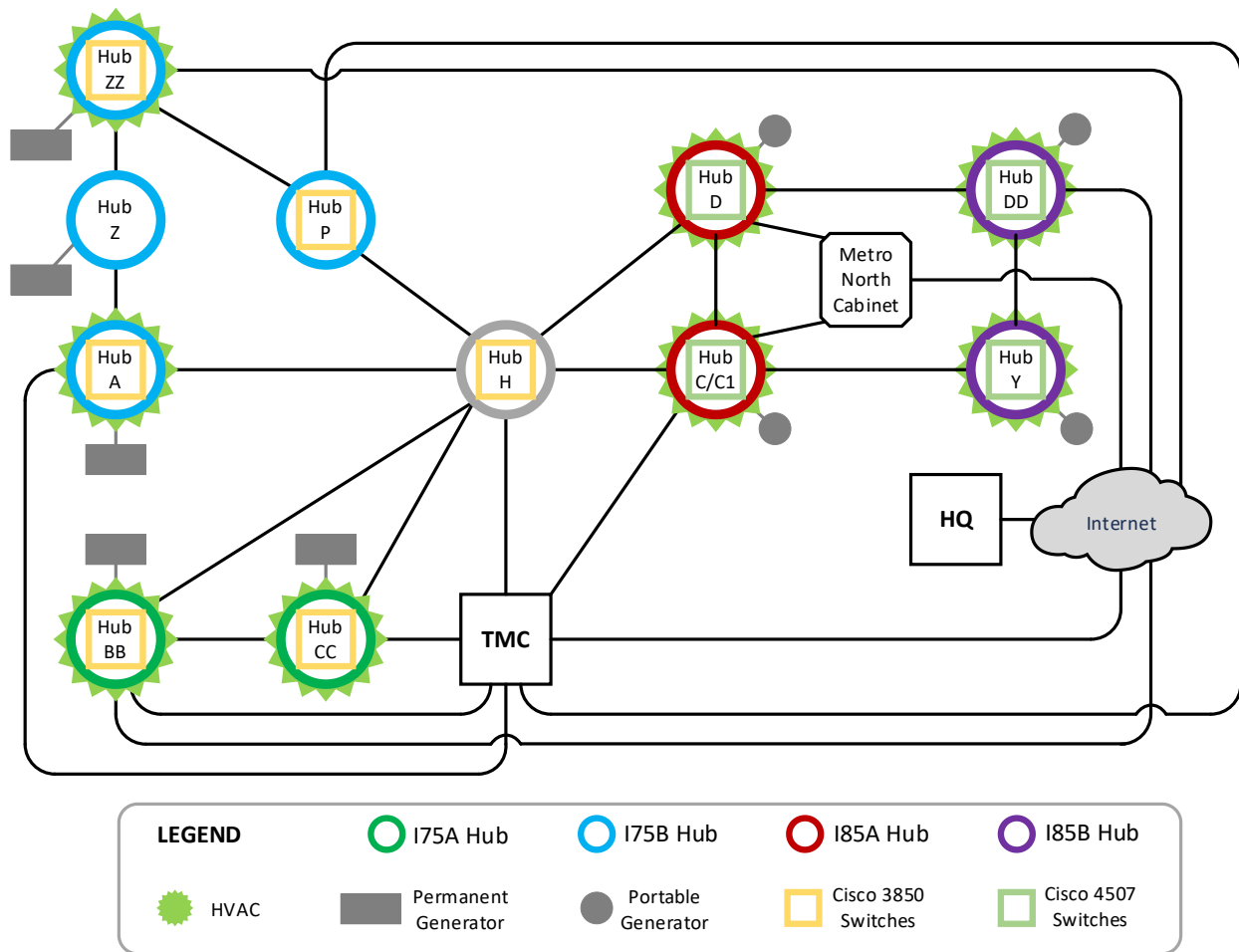


Figure 6: SRTA Tolling System Network Hubs

Communication Network Hub Sites in Appendix C: Existing Infrastructure Tables lists the corresponding hub buildings that house toll related equipment supporting the ETCS along each existing facility. The TISC is required to install their proposed toll related communication equipment in these hub buildings. No additional communication network hub sites will be built for the existing facilities. For details of all existing HUB locations please refer to Appendix C: Existing Infrastructure Tables.

The following paragraphs provide a high-level description of the roadside equipment and hub connectivity and spare fiber availability for the four facilities:

#### 2.1.2.1.1.1 I-75A Metro South

The existing communications network for I-75A Metro South is provisioned between Hub CC and Hub BB as shown in Figure 7: I-75A Communications Network Layout. Hub BB has an internet service provider connection to Comcast. The detailed documentation of the fiber optic cable network for I-75A can be found in Attachment 3: Existing As-Builts.

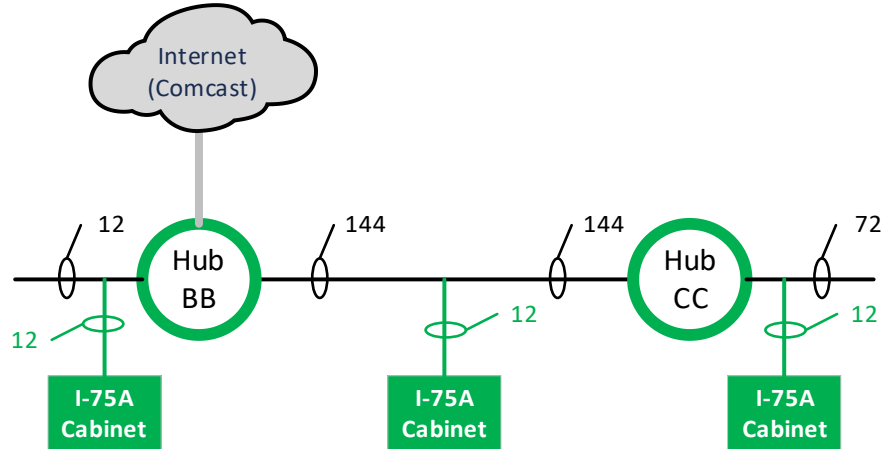


Figure 7: I-75A Communications Network Layout

I-75A has an existing SRTA 144-count single mode fiber optic cable (SMFO) as a backbone trunk between Hub CC and Hub BB. To connect equipment located north of Hub BB and south of Hub CC, I-75A has a SRTA 12-count SMFO from Hub BB to north of Hub BB and a SRTA 72-count SMFO from Hub CC to south of Hub CC.

Each cabinet is connected through a 12-strand SMFO to the backbone.

The I-75A SMFO backbone trunk allocation includes one set of four fibers (transmit, receive, spare, spare) for each I-75A toll site in a home run configuration to both Hubs. The I-75A SMFO backbone trunk allocation includes also one set of four fibers (transmit, receive, spare, spare) for ITS device groups in a daisy chain configuration to the Hubs.

An equal number of spares and active fibers are provided in each toll and ITS device cabinet. In addition to terminated spares in the cabinets, there are over fifty (50) spare backbone trunk fibers along I-75A.

#### 2.1.2.1.1.2 I-75B Northwest Corridor (NWC)

The existing communications network for I-75B NWC is provisioned between Hub A, Hub Z and Hub ZZ as shown in Figure 8: I-75B Communications Network Layout. Hub ZZ has an internet service provider connection to AT&T. The detailed documentation of the fiber optic cable network for I-75B can be found in Attachment 3: Existing As-Built.



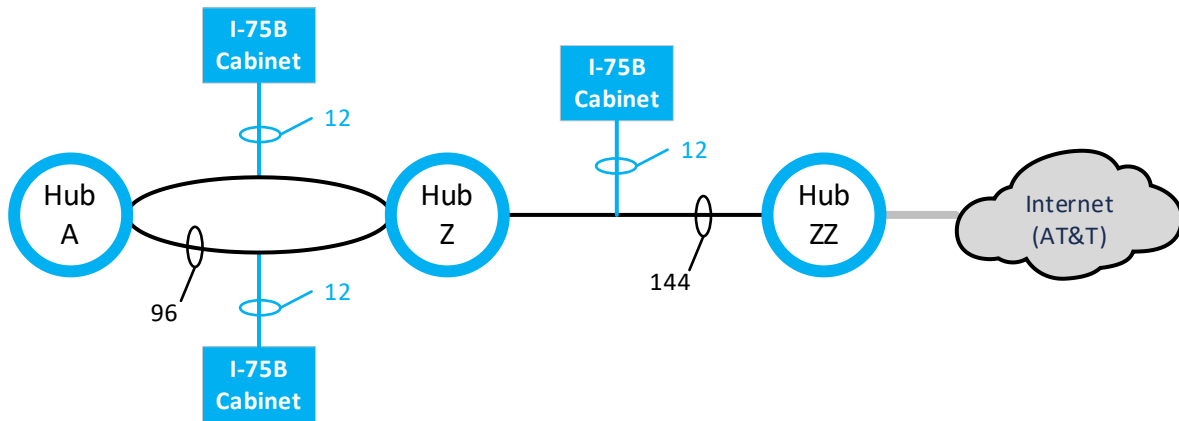


Figure 8: I-75B Communications Network Layout

I-75B has an existing SRTA 96-count SMFO as a backbone trunk between Hub A and Hub Z and an existing SRTA 144-count SMFO as a backbone trunk between Hub Z and Hub ZZ.

Each cabinet is connected through a 12-strand SMFO with the backbone.

The I-75B SMFO backbone trunk allocation includes one set of four fibers (transmit, receive, spare, spare) for each toll site. The active fiber for each toll site is in a home run configuration between Hub A and Hub Z. The spare fiber for most toll sites is in a daisy chained configuration for two toll site cabinets (spares are shared between two toll sites).

The I-75B SMFO backbone trunk allocation includes one set of four fibers (transmit, receive, spare, spare) for ITS device group in a daisy chain configuration to the Hubs. Most equipment is attached to the backbone between Hub A and Hub Z and some equipment is attached between Hub Z and Hub ZZ.

An equal number of spares and active fibers are provided in each toll and ITS device cabinet. Other than the terminated spares which drop to each cabinet, there are limited spares on the I-75B backbone trunk.

#### 2.1.2.1.1.3 I-85A and I-85B

The existing communications network for I-85A is provisioned between Hub C/C1 and Hub D and for I-85B between Hub Y and Hub DD as shown in Figure 9: I-85A and I-85B Communications Network Layout. Hub C/C1 and Hub D are connected to the internet via Metro North Cabinet. Hub DD has also an internet service provider connection. The detailed documentation of the fiber optic cable network for I-85A and I-85B can be found in Attachment 3: Existing As-Builts.

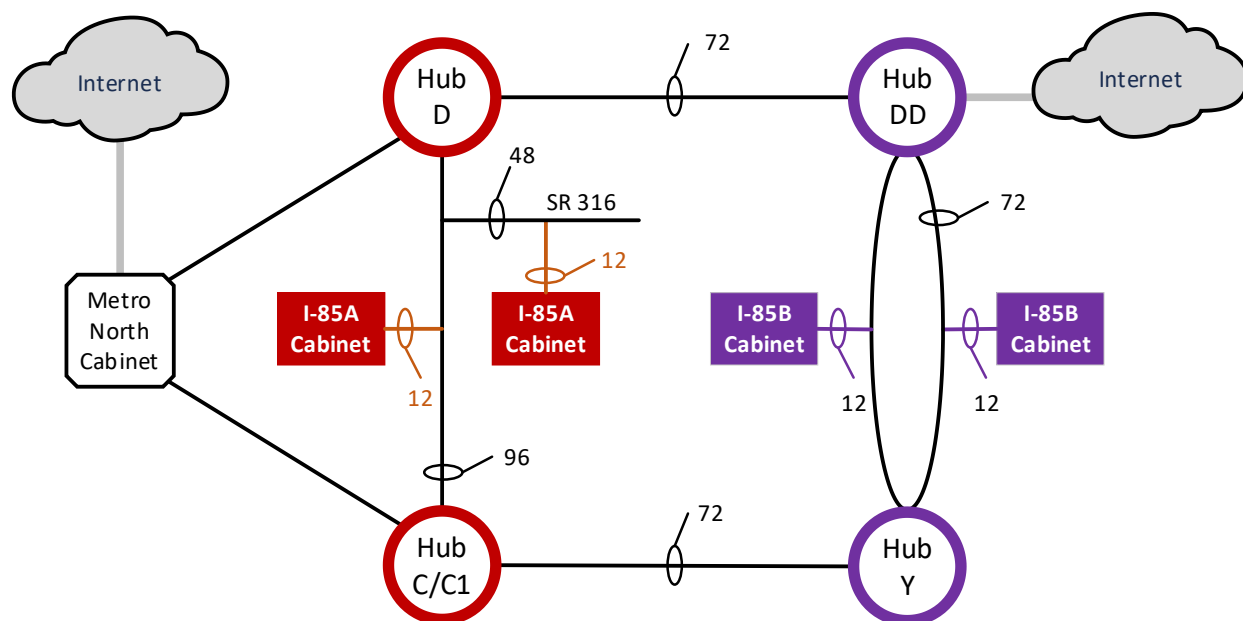


Figure 9: I-85A and I-85B Communications Network Layout

I-85A and I-85B have an existing SRTA 72-count SMFO as a backbone trunk between Hub C1, Hub D, Hub Y and Hub DD. I-85B FO network includes also a SRTA 48-count SMFO along SR 316 which connects into the SRTA 96-count SMFO backbone between Hub D and Hub C/C1.

Each cabinet is connected through a 12-strand SMFO with the backbone.

The I-85A and I-85B SMFO backbone trunk allocation includes three fibers (transmit, receive, spare) for each CCTV camera, toll rate sign and general-purpose lane AVI scanning cabinet in a daisy chain configuration to the Hubs.

For each toll site on I-85A and I-85B the SMFO backbone trunk allocation includes six fibers (transmit, receive, spare, transmit, receive, spare) in a daisy chain configuration to the Hubs.

To provide the same number of spare fiber as active fiber in each cabinet would require additional splices into the backbone trunk at the point where the existing 12-count SMFO laterals tie into the backbone trunk. In addition to terminated spares in the cabinets, there are over 12 spare backbone trunk fibers along I-85A and I-85B.

#### 2.1.2.1.2 Hub Electrical and Communications Infrastructure

As indicated in Appendix C: Existing Infrastructure, I-75 Communications Hubs A, BB, CC, Z, and ZZ are connected to permanent generators with an included Automatic Transfer Switch (ATS) co-located within the enclosed fence area at the hub site. I-75 facility communication network Hubs A, BB, CC, and ZZ also can be powered by a mobile generator via connection to a Manual Transfer Switch (MTS).

The I-85 facilities do not have permanent generators. For these facilities, GDOT provides the ability to connect portable generators (see Section 2.1.2.1.3 Electrical Infrastructure below for further details).

Hub buildings DD, Y, D and C/C1 contain Cisco 4507 switches, UPS units and batteries. Hub buildings BB, CC, A, ZZ, P and H contain Cisco 3850 switches, UPS units and batteries.

Hub buildings A, BB, CC, ZZ, D, DD, C/C1 and Y are equipped with HVAC unit(s) and environmental monitoring sensors (temperature and humidity).

Hub P which is used to regenerate the optical signals between Hub ZZ and Hub H due to the distance between them and Hub P, used as a signal collector are not equipped with HVAC units and do not currently include environmental monitoring sensors, as they contain limited equipment (i.e., only switches and not servers or storage). It will be the responsibility of the TISC to determine if environmental monitoring is needed to support the TISC ETCS infrastructure in any of the Hub Buildings.

ETCS communication infrastructure at the TMC and SRTA Headquarters (HQ) is managed and maintained by SRTA IT. The TISC should not be required to provide any communication network infrastructure at those locations other than WAN connections between those networks and the TFH cloud instances.

It must be noted that future growth may drive additional paths through Hub buildings not referenced herein.

As part of the intergovernmental agreement between GDOT and SRTA, GDOT is the owner of all Communications Network Hub buildings.

Table 1: Communication Network Hub Equipment and Infrastructure below provides a list of devices, equipment, and infrastructure that are required, eligible, or ineligible for re-use.

**Table 1: Communication Network Hub Equipment and Infrastructure**

Item	Re-Use
Building	Required
Fiber Patch Panel	Required
FDU	Required
Layer 1 Infrastructure	Required
Core Switches (Layer 3 Infrastructure)	Ineligible
UPS and Batteries	Ineligible
Electrical Infrastructure (except UPS)	Required
Racks and Cabinets	Eligible

It is the responsibility of the TISC to understand the available space in each communication network hub building and the available space in the existing racks in each communication network hub building to allow for installation of any required devices and/or additional racks needed for the transition and final installation of the ETCS.

#### *2.1.2.1.3 Electrical Infrastructure*

All communication network hubs and toll equipment cabinets are powered by utility power and by various backup power devices such as UPS and batteries, permanent generators, mobile generators, or portable generators which vary by facility. Some of the communication network hubs, toll equipment cabinets, and related structures are equipped with lightning and grounding protection along with surge protection devices. It is the responsibility of the TISC to validate the available utility power at each location.

I-75 facilities have both permanent natural gas generators and mobile generators that are trailer mounted for backup power while the I-85 facilities employ only handheld portable generators that must be supplied by the TISC. Permanent generators are fueled by a direct connection to a natural gas utility. Mobile generators are fueled by diesel and portable generators are fueled by gasoline. Refer to Appendix C: Existing Infrastructure Tables for all generator types and quantities.

All communication network hub buildings and toll equipment cabinets have a UPS that protects the hardware from unexpected power distribution or power loss. The TISC may not re-use any of the existing UPS devices or batteries.

The existing permanent generators for the 75 facilities have been designed to provide backup power for Hubs, Toll Points and TRDMS signs. Attachment 3: Existing As-builts provides the details for the interconnectivity of the permanent generators. The 80kW mobile generators can connect to an MTS located at the communication network hub sites and at certain toll point sites. The 20kW mobile generator can connect to an MTS located at certain toll point sites.

Table 2 provides the list of required re-used generator-related items.

**Table 2: Generator Electrical Equipment and Infrastructure**

Item	Re-Use
Permanent Generator	Required
Mobile Generator	Required
Portable Generator	Ineligible
Automatic Transfer Switch	Required
Manual Transfer Switch	Required
Conduit, power panels, circuit breakers, receptables, PDU's, above and below ground power cable, service meters	Required

The TISC will be required to provide four (4) portable generators for use on the I-85 A and B Facilities. TISC supplied portable generators must be capable of powering I-85 Toll Points and core distribution switches within the I-85 communication network hub buildings. Portable generators are not intended to power the entire communication network hub building. The portable generators can connect to an MTS located at each toll equipment cabinet for the I-85 facility. The MTS is located inside the toll equipment cabinets for the I-85A facility. The MTS is located on the outside of the toll equipment cabinets for the I-85B facility.

Following are the requirements for portable generators:

No.	Portable Generator Requirements
	The TISC shall supply four (4) new 120V/240V dual output voltage portable generators sized to carry the full electrical load of the equipment at the TISC transitioned I-85 Toll Points, TRDMS Sites, and core switches in the Hub buildings, plus 25 percent additional capacity.
	The TISC shall ensure the portable generators supplied can provide sufficient power to maintain normal operations until utility power is restored at an affected site.

No.	Portable Generator Requirements
	TISC supplied portable generators shall be able to connect to the existing I-85 Manual Transfer Switches (MTS) located within the I-85A cabinets and outside of the I-85B cabinets.
	The TISC shall ensure the connection to the portable generator allows authorized personnel to access, connect, and secure an external power source to the Toll equipment cabinet to restore power within fifteen (15) minutes of arrival time at the site.
	The TISC shall ensure the hook up component of the portable generator to the I-85 Toll equipment cabinet allows the Toll equipment cabinet doors to be fully closed at all times.
	The TISC shall ensure the portable generators are easily accessible to Maintenance technicians so that they can refuel the tanks in the event of an extended power outage.
	The TISC shall use the portable generator electrical power to provide backup power to the UPS.
	<p>TISC provided portable generators shall supply temporary power to support the following toll system elements during a multiple concurrent utility power failure, in the following order of importance:</p> <ol style="list-style-type: none"> <li>1. Hub building Core Switches and WAN Location(s).</li> <li>2. TRDMS Sites.</li> <li>3. Toll points.</li> <li>4. TRDMS CCTV Sites.</li> </ol>

Following are the UPS Requirements:

No.	UPS Requirements
	The TISC shall design, furnish, install, test and maintain UPS units in ETCS equipment cabinets.
	<p>The UPS shall protect the ETCS equipment at each of the following locations:</p> <ol style="list-style-type: none"> <li>1. Toll Points.</li> <li>2. TRDMS.</li> <li>3. Travel Time Sites.</li> <li>4. ETCS equipment racks located within the communication network hub buildings.</li> <li>5. TRDMS CCTV cameras.</li> <li>6. Traffic CCTV cameras.</li> <li>7. DVAS CCTV cameras (if not co-located with a toll point).</li> <li>8. Traffic Sensors (Microwave Detectors).</li> <li>9. Generator sites.</li> <li>10. WAN sites outside of communication network hub building locations.</li> </ol>
	The UPS supplied shall be compatible for use with permanent, portable and mobile generators, as applicable, to allow power continuity and connectivity with no tools required.
	All I-85 ETCS equipment shall be UPS protected for a minimum of two (2) hours of full operation, excluding HVAC.

No.	UPS Requirements
	I-75 ETCS equipment shall be UPS protected for the minimum time indicated below in full operation, excluding HVAC: 1. Toll Point – 0.50 hours. 2. TRDMS – 1 hour.
	The UPS shall continue to power the ETCS equipment until battery power expires or generator power is supplied.
	At I-75 locations connected to a permanent generator, if an online UPS fails, an auto-sync transformer shall bridge line power and utility power within one cycle of the AC line power such that no power is lost, only backup capability is lost.
	Whenever any of the following occur, an alert shall be generated by the UPS and sent to maintenance personnel and SRTA staff via the MOMS: 1. UPS begins to power equipment. 2. UPS battery level reaches a configurable low point. 3. Utility power has been restored.
	The TISC shall provide a surge protection device to protect utility service that is not UPS filtered.

#### 2.1.2.1.4 Existing Site Types

SRTA's existing tolled facilities include the following toll site types: Communication Network Hub, Electrical Infrastructure, Toll Point, Travel Time, TRDMS, TRCCTV Camera, CCTV Camera, and Traffic Sensor. Toll sites can be standalone or co-located with other toll site types. The roadside infrastructure varies by facility. Table 3 below describes each toll site type.

**Table 3: Toll Site Types**

Toll Site Type	Description
Communication Network Hub Site	A concrete building located along the Right of Way (ROW) within the facility limits which may house some or all the following equipment: Hub UPS, ISP hardware, firewall hardware, video servers, storage area network, network equipment, switches, and Metro Area Network (MAN) infrastructure. Includes sites with a third-party network access point.
Electrical Infrastructure Site	A fence enclosed permanently installed natural gas generators, portable generators, mobile generators and UPS equipment that provides backup power to toll sites.
Toll Point Site	A site where toll collection hardware (AVI, VES, AVDC) are installed to create Transactions from vehicles detected in the express lanes.
Travel Time site	A site that includes AVI equipment installed over the general-purpose or arterial lanes such that transponder penetration data can be collected.

Toll Site Type	Description
Toll Rate Dynamic Message Sign (TRDMS) Site	A site that includes Dynamic Message Sign(s) (DMS) located before entrances to express lane Tolling Segments that displays toll rate information.
TRDMS CCTV/ CCTV Camera Site	Sites where video cameras and related equipment are installed to capture video of traffic, TRDMS and vehicles traveling through toll points.
Traffic Sensor site	A site that includes devices (e.g., MDS or RTMS) that detect vehicles and provides traffic data (speed, volume, direction) across specified lanes.

Each toll site type is comprised of devices, equipment, and infrastructure to support the ETCS. Appendix F: Line of Demarcation provides drawings of toll site types depicting responsibility between the TISC and others for device, equipment, and infrastructure installation and maintenance.

#### 2.1.2.1.4.1 Toll Point Infrastructure

Toll Point sites have distinctive roadside infrastructure features that vary by facility. Toll Point sites may have equipment mounted on a GDOT Type I, Type III, or Type IV gantry structure. Road surfaces within the Toll Point are either concrete or asphalt. Toll Points can contain concrete barrier walls or are buffer separated and have single or multiple toll lanes, with and without shoulders. Toll Point equipment cabinets are either pole mounted, or ground mounted on either a fiberglass base or a concrete pad. Not all Toll Points have maintenance areas. For those that do, some come with or without driveway access. This section describes the roadside infrastructure features of Toll Point sites on each facility, the various devices, equipment, and infrastructure required and allowed for re-use, the toll lane configurations, and Toll Point sites to be decommissioned.

The TISC shall re-use all the toll equipment cabinets that are needed and shall decommission what is not re-used. If the TISC determines additional racks/ cabinets are required for the ETCS, any additional costs will be the responsibility of the TISC.

Table 4 below provides a list of devices, equipment, and infrastructure that are required, eligible, or ineligible for re-use.

**Table 4: Toll Equipment Cabinet Equipment and Infrastructure**

Item	Re-Use
Toll Equipment Cabinet (including Air Condition units)	Required (as needed)
Fiber Patch Panel	Required
Layer 1 Infrastructure	Required
Cabinet Switch (Layer 2 Infrastructure)	Ineligible
UPS and Batteries	Ineligible
Electrical Infrastructure (Excluding UPS)	Required

Toll Point site gantry structures have only ETCS equipment. Table 5 below provides a list of required and eligible for re-use infrastructure.

**Table 5: Toll Point Site Device, Equipment, and Infrastructure**

Item	Re-Use
Gantry Structure	Required
Tubular Extension (used for Traffic Sensors, AVI, and CCTV cameras)	Required
Stringer	Required
Brackets	Required
Strain Poles	Required
Rigid and flexible conduit	Required
Wireway	Required
Junction and Pull boxes	Required
Inductive loop conduit and pull box (1)	Required
Inductive loop cables and wiring	Eligible
Inductive Loop(s)	Eligible
RFID (AVI) Antennas and Readers	Eligible

The TISC may elect not to use loops in the provided solution, re-use the existing loop configuration or install a new loop configuration. If the TISC chooses the latter option, they will be responsible for repairing any damage to the asphalt/concrete. The TISC will need to submit any proposed new loop configurations to SRTA for review and approval before commencing any such work. At a minimum, the TISC proposal will need to confirm 1) the design will not require any overcuts that create the possibility for pavement to break off; 2) the design must identify the minimum distance of any cut from a pavement expansion joint; and 3) that all existing loops will be cut into pieces and the saw cuts sealed with epoxy as part of the installation work.

Table 6 below provides the list of required and eligible re-use as applicable.

**Table 6: Toll Point Maintenance Area Device, Equipment, and Infrastructure**

Item	Re-Use
Maintenance area	Required
Bollards	Required
UPS and Batteries	Ineligible
Electrical infrastructure (Except UPS)	Required
Layer 1 infrastructure	Required
Toll equipment cabinet	Required
HVAC unit	Eligible



#### 2.1.2.1.4.2 Existing I-75 Toll Point Sites

The existing I-75 facilities Toll Point sites are configured for either single direction or as a reversible Toll Point. Single direction Toll Point sites consist of three main loops and a set of axle loops. Reversible Toll Point sites consist of four main loops and axle loops. I-75 facility Toll Point sites consist of two GDOT Type I gantry structures. These gantry structures have a spacing of twenty-nine (29) feet from gantry centerline to gantry centerline for single direction Toll Point sites and twenty-four (24) feet from gantry centerline to gantry centerline for reversible Toll Point sites. I-75 facilities' gantry structures are equipped with tubular extensions, stringers, wireways, rigid conduit, flexible conduit, pull boxes, and brackets.

As part of the existing ETCS, the following devices are installed at the Toll Point site: AVI antennas; AVI readers; lasers; VES Cameras and VES illuminators; and audit and security CCTVs. The direction of travel beacons are devices installed on the reversible Toll Point sites only. These beacons will be decommissioned by the TISC as part of this RFP.

The Toll Point site pavement consists of a 150-foot linear non-ferrous reinforced concrete with glass fiber reinforced polymer (GFRP) dowel bars and baskets with imbedded conduit for the Inductive Loop systems.

Each Toll Point site has a corresponding 332 SED toll equipment cabinet installed inside an enclosed concrete pad maintenance area adjacent to the Toll Point or within three hundred (300) feet. The maintenance area may be equipped with two 332 SED toll equipment cabinets for Toll Point sites that share one maintenance area. The maintenance area allows access for maintenance vehicles and is protected by a concrete barrier. The following infrastructure is within the enclosed maintenance areas: bollards, electrical and communication conduit, electrical and communication pull boxes, MTS, low voltage transformer, disconnect, and lightning and grounding protection system. The 332 SED toll equipment cabinet is equipped with a 5000 BTU 240VAC HVAC unit, sunshields, FPP, 19" EIA rack assembly, and other electrical infrastructure.

The network for the I-75 Toll Point sites is point-to-point ("home run") architecture. Each Toll Point site has a pair of live and dark dedicated fibers for communication with two communication network hubs. Appendix C: Existing Infrastructure Tables includes a detailed listing of the toll equipment cabinet parts and components.

Travel lanes and shoulder lanes that are ten (10) feet wide or greater will be fully equipped. Shoulder lanes that are greater than four (4) feet wide, but less than ten (10) feet wide, will have limited equipment. Shoulder lanes equal to or less than four feet wide will not be equipped. Fully equipped lanes will include AVI, AVC, VES, and DVAS subsystems. Limited equipment lanes will include VES and equipment required to trigger VES cameras and detect direction of vehicle travel. The following sections describe requirements for the lane-level equipment. Refer to Appendix C: Existing Infrastructure Tables for typical lane configurations and total toll lane quantities. Attachment 3: Existing As-builts provides the details for each Toll Point site and shows which shoulder is "left" and "right".

#### 2.1.2.1.4.3 Existing I-85 Toll Point Sites

The I-85A Toll Point sites consist of a physical gantry and two barrier or ground mounted strain poles per direction. VES cameras are mounted to one strain pole, while the Toll loop junction box or loop pull box is mounted on the other pole. The I-85B Toll Point sites consist of one physical gantry and one barrier or ground mounted strain pole for the VES cameras. The gantry structures may be GDOT Type I, GDOT Type III, or GDOT Type IV. The gantry structures are equipped with tubular extensions, junction boxes, rigid conduit, flexible conduit, pull boxes, and brackets.

As part of the existing ETCS, one or more of the following devices are installed at the Toll Point site: AVI antenna; AVI reader; RTMS units; illuminator; and VES Camera, TRCCTV and CCTV Cameras. AVI antennas are installed on equipment support structure H brackets. RTMS devices are installed on various tubular extension arms.

Shoulders on the I-85 are not instrumented.

Not all the Toll Points on either of the 85 facilities will transition to the TISC. SRTA will maintain a minimum of three (3) Toll Points per segment with an approximate one mile spacing between them. Spare Toll Points are to be decommissioned as shown in Appendix C: Existing Infrastructure Tables.

The Toll Point site pavement is asphalt and consists of one loop pair with no axle loops. The AVDC Loops are installed in or below the friction course.

Each Toll Point site on the I-85A facility has one 336S and one OD-50DD toll equipment cabinet mounted to the upright of the gantry or ground mounted. The 336S toll equipment cabinet houses the network switch, fiber, FPP, and UPS, while the OD-50DD toll equipment cabinet houses the tolling equipment.

Each Toll Point site on the I-85B facility has one 336S toll equipment cabinet mounted on a concrete pad maintenance area adjacent to the Toll Point. Each maintenance area contains electrical and communication conduit, electrical and communication pull boxes, MTS, transformer, lightning and grounding protection system, and a utility disconnect.

Both the OD-50DD and 336S toll equipment cabinets are equipped with environmental controls, each with a different make/model, as well as sunshields, FPP, 19" EIA rack assembly, and other electrical infrastructure.

The network for the Toll Point sites is a closed loop daisy chained implementation. Appendix C: Existing Infrastructure Tables provides the detail listing of the toll equipment cabinet parts and components.

The tables included in Appendix C: Existing Infrastructure Tables, detail the typical lane configuration, the total toll lanes for the I-85 facilities, and the Toll Point sites designated to be decommissioned. Toll Point sites in *red italics* in Appendix C: Existing Infrastructure are to be decommissioned. TISC shall keep all TRDMS CCTV and CCTV Cameras operational at any Toll Point locations identified as being decommissioned. RTMS devices at decommissioned Toll Points should be decommissioned or removed. See Section Decommission Existing Facilities 2.1.2.2: Decommission Existing Facilities for additional details. Attachment 3: Existing As-builts provide the roadside infrastructure details for each Toll Point site.

#### *2.1.2.1.5 Travel Time Infrastructure*

Travel Time sites are installed along all SRTA's existing facilities. Travel Time sites are located along the mainline general-purpose lanes and the roadways providing direct arterial access to the express lanes. The mainline general-purpose Travel Time sites consist of one AVI antenna over each general-purpose lane. The arterial access Travel Time sites consist of one AVI antenna over the lane or turn lane for each approach to the express lane facility depending upon the physical configuration of each intersection.

For I-75 facilities, Travel Time sites along the mainline general-purpose lanes are installed on GDOT Type I structures and on mast arm structures along the roadways providing direct arterial access. For I-85 facilities, Travel Time sites along the mainline general-purpose lanes are installed on either GDOT Type I, Type III, or Type IV structure. There are no arterial access Travel Time sites for the I-85 facilities.

Existing Travel Time sites will either be transitioned at their current location or decommissioned. New Travel Time equipment and devices will need to be installed at existing TRDMS sites that do not currently

contain such equipment. The decommissioning of select Travel Time sites aligns with SRTA's goal to remove roadside equipment and structures which are no longer needed for Express Lane operations.

All TRDMS sites within the I-75 facilities have existing co-located Travel Time sites. For I-85 facilities, TRDMS sites are not co-located with Travel Time sites; the TISC will need to install Travel Time site equipment and devices on these signs.

Table 7 below provides the quantity of existing Travel Time sites that are to be transitioned (either co-located with a TRDMS or standalone), the quantity of Travel Time sites that are to be decommissioned, the quantity of new Travel Time Sites that are to be installed at existing TRDMS sites, and the final quantity of Travel Time sites per facility.

**Table 7: Travel Time Site Quantities**

Facility	Current Number of Travel Time Sites	Transition (Co-located with TRDMS Site)	Transition (Standalone)	Decommission	Install at TRDMS Site	Final Travel Time Sites
75A	18	8	3	7	N/A	11
75B	37	16	5	17	N/A	21
85A	13	2	1	10	10	13
85B	11	N/A	1	10	9	10
					Total	55

Refer to Appendix C: Existing Infrastructure Tables for Travel Time Sites locations and quantities, and indication of which Travel Time sites are co-located with TRDMs signs and which sites are to be decommissioned. Appendix C: Existing Infrastructure Tables also details I-85A and I-85B Travel Time Sites and indicates which Travel Time sites are co-located with TRDMs signs and which sites are to be decommissioned. All I-85 Travel Time site equipment is housed in 336S cabinets.

Table 8 provides the list of required and eligible for re-use devices, equipment, and infrastructure for this Toll Site Type.

**Table 8: Standalone Travel Time Site Devices, Equipment, and Infrastructure**

Item	Re-Use
Gantry Structure	Required
Stringer	Required
Brackets	Required
Rigid and flexible conduit	Required
Wireway	Required
Pull box	Required
AVI Antenna	Eligible
Reader	Ineligible

Item	Re-Use
Toll Equipment Cabinet	Required
Fiber Patch Panel	Required
Layer 1 Infrastructure	Required
Cabinet Switch (Layer 2 Infrastructure)	Ineligible
UPS and Batteries	Ineligible
Electrical Infrastructure (Excluding UPS)	Required

For I-85 TRDMS sites at which the TISC will install Travel Time site equipment and devices, no additional 336 toll equipment cabinets are to be installed. New Travel Time equipment and devices will share use of the existing TRDMS toll equipment cabinets. The communication and power from the AVI devices must terminate at the existing TRDMS toll equipment cabinet.

#### 2.1.2.1.6 TRDMS Infrastructure

The TISC is required to decommission all existing TRDMS and components and furnish new TRDMS and components for the ETCS. TRDMS sites are located prior to each entry access to the express lane facility. Each TRDMS site has a corresponding toll equipment cabinet(s) that contain the sign controllers, electrical, and communication equipment. TRDMS are installed on full span gantry structures along the mainline for all facilities. Table 9 provides the list of required and eligible for re-use devices, equipment, and infrastructure for this Toll Site Type.

**Table 9: TRDMS Site Equipment and Infrastructure**

Item	Re-Use
Gantry Structure	Required
Stringer	Required
Brackets	Required
Rigid and flexible conduit	Required
Wireway	Required
Pull box	Required
Fiber Patch Panel	Required
UPS and Batteries	Ineligible
Electrical infrastructure (Except UPS)	Required
Layer 1 infrastructure	Required
Cabinet Switch (Layer 2 Infrastructure)	Ineligible
Toll equipment cabinet	Required
HVAC unit	Eligible
DMS Panel/DMS Insert	Ineligible
DMS Controller	Ineligible

I-75 facilities arterial TRDMS are mounted on either single, double, or triple post sign structures. The I-75 facilities TRDMS toll equipment cabinets have a direct fiber connection to the GDOT RACS cabinets.

All I-75A TRDMS sites have a corresponding 332 SED toll equipment cabinet that shares co-located Travel Time equipment. These cabinets do not contain HVAC units. None of the I-75A TRDMS toll equipment cabinets have an MTS for connecting a mobile generator. The I-75A TRDMS are connected to the natural gas permanent generator. Appendix C: Existing Infrastructure Tables: I-75A TRDMS Sites provides the character size and quantity of DMS inserts that are to be provided by the TISC.

All I-75B TRDMS sites have a corresponding 332 SED toll equipment cabinet, or a combination of a 332 SED and 332 ED toll equipment cabinet that shares co-located Travel Time equipment. TRDMS sites with three DMS inserts have the combination of the toll equipment cabinets. None of the I-75B TRDMS toll equipment cabinets have a Manual Transfer Switch for connecting a mobile generator. The I-75B TRDMS are connected to the natural gas permanent generator. Appendix C: Existing Infrastructure Tables: I-75B TRDMS Sites provides the character size and quantity of DMS panels and inserts that are to be provided by the TISC.

All TRDMS sites on the I-85 facilities are located along the mainline and mounted overhead on a GDOT Type I gantry structure. Each TRDMS site on the I-85A facility has two corresponding 336S toll equipment cabinets. One 336S toll equipment cabinet houses the network switch, the UPS, and power supplies, while the other cabinet houses the DMS electronics. All of the I-85A toll equipment cabinets have an MTS for connecting a portable generator. None of these cabinets contain an HVAC unit.

Each TRDMS site on the I-85B facility has one corresponding 336S and one 334 toll equipment cabinet mounted to the upright of the gantry or ground mounted. The 334-toll equipment cabinet houses the network switch, UPS, power supplies, and FDC while the 336S toll equipment cabinet houses the DMS electronics, including a secondary UPS unit. All of the I-85B TRDMS toll equipment cabinets have an MTS for connecting a portable generator, but not an HVAC unit. Appendix C: Existing Infrastructure Tables: I-85A TRDMS Sites and I-85B TRDMS Sites provide the character size and quantity of DMS panels required per site as well as the TRDMS sites that have a co-located Travel Time site. As mentioned in Section 2.1.2.1.5, for TRDMS sites that are not co-located with a Travel Time site, the TISC is required to install Travel Time site equipment and devices using the existing TRDMS toll equipment cabinets.

#### *2.1.2.1.7 TRDMS CCTV/CCTV Camera Infrastructure*

There are four (4) main functions for CCTVs on the existing facilities listed below, along with the term commonly used in this RFP to describe them:

1. TRDMS CCTV cameras: Capture live video feed of toll rates posted on TRDMS.
2. Traffic CCTV cameras: Capture live video of traffic for traffic surveillance capabilities.
3. Audit (DVAS) CCTV cameras: Captures live video for vehicle transaction audit capabilities on the DVAS subsystem.
4. Security CCTV cameras: Capture live video at Toll Points and Hub buildings for security monitoring.

TRDMS CCTV, audit CCTV, and security CCTV cameras are located along the I-75 facilities. One TRDMS CCTV camera is installed close to each TRDMS to facilitate monitoring of the rates displayed on that sign.

Audit and security CCTV cameras are located at the Toll Points. Security cameras<sup>1</sup> are also located at the Hub buildings of each I-75 facility.

TRDMS CCTV cameras and traffic CCTV cameras are located along the I-85 facilities.

The TISC may not re-use any of the CCTV cameras or auxiliary equipment.

The TISC is required to decommission all existing CCTV cameras and components and furnish new TRDMS, traffic and audit CCTV cameras and components for the ETCS. Security CCTV cameras will not be replaced following decommissioning.

CCTV cameras are pole mounted at a minimum height of 30 feet up to 75 feet or mounted on a tubular extension at various heights attached to a gantry structure. No additional concrete pole structures will be built, nor will additional tubular extensions be provided under this contract.

Table 10 provides the quantity of TRCCTV/CCTV Camera sites per facility.

**Table 10: TRDMS CCTV/CCTV Camera Site Quantities**

Facility	TRCCTV Cameras	Traffic CCTV Cameras	Audit CCTV Cameras
75A	8	N/A	12
75B	16	N/A	26
85A	13	15	N/A
85B	12	27	N/A

Appendix C: Existing Infrastructure Tables, identifies camera site types and usage for all facilities (75A, 75B, 85A, and 85B).

All I-75A TRDMS CCTV sites with the exception of Site Number 2, share a 332 SED toll equipment cabinet with a co-located TRDMS. These cabinets do not contain HVAC units. . Audit and security CCTV cameras share a 332 SED equipment cabinet with a toll point or a hub building.

All I-75B TRDMS CCTV sites have corresponding 332 SED toll equipment cabinets. Audit CCTV cameras share an equipment cabinet with a toll point or a hub building. See Appendix C: Existing Infrastructure Tables for TRDMS CCTV site details.

All I-85A and I-85B TRDMS CCTV Cameras are housed in 336S cabinets.

Table 11: TRDMS CCTV/CCTV Camera Site Equipment and Infrastructure provides the list of required and eligible re-use devices and components.

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<sup>1</sup> These security CCTV cameras are not listed in the

**Table 11: TRDMS CCTV/CCTV Camera Site Equipment and Network Infrastructure**

Item	Re-Use
Gantry Structure	Required
Concrete Pole Structure	Required
Tubular Extension	Required
Brackets	Required
Rigid and flexible conduit	Required
Wireway	Required
Pull box	Required
Fiber Patch Panel	Required
UPS and Batteries	Ineligible
Electrical infrastructure (Except UPS)	Required
Layer 1 infrastructure	Required
Toll equipment cabinet	Required
HVAC unit	Eligible
Cabinet Switch (Layer 2 Infrastructure)	Ineligible

#### 2.1.2.1.8 Traffic Sensor Infrastructure

Traffic sensor devices are installed on concrete pole structures along the I-75 facilities and capture traffic data for northbound and southbound general-purpose lanes and the express lanes. Some of the devices are configured to capture traffic in both directions of travel across multiples lanes. Traffic sensor devices are installed on a horizontal tubular extension mounted to the Toll Point site gantry upright along the I-85 facilities to capture traffic data in the general-purpose lanes. These devices are orientated one per direction and face away from the centerline of the roadway. The TISC is required to decommission all existing traffic sensor devices and furnish new microwave detector devices and components for the ETCS.

The tables in Appendix C: Existing Infrastructure Tables for I-85A Traffic Sensor Sites and I-85B Traffic Sensor Sites identify the current location of the I-85 traffic sensors. All I-85A traffic sensor sites share a 336S cabinet with a toll point.

#### 2.1.2.2 Decommission Existing Facilities

The TISC shall decommission several Toll Sites as identified in this scope of work. Refer to Appendix C: Existing Infrastructure Tables for additional details regarding quantity, location, and disposition for reuse or decommissioning. The following lists the requirements for all decommissioning:

No.	Decommissioning Requirements
	For any Tolling Point identified as being decommissioned in Appendix C: Existing Infrastructure Tables (85A and 85B only), the TISC will keep any co-located TRDMS CCTV and CCTV cameras operational until they are replaced.

No.	Decommissioning Requirements
	For all decommissioned Tolling Points where TRDMS CCTV and/or CCTV cameras will remain following replacement, any equipment required for the support and functionality of the cameras must also remain and/or be replaced as required, including UPS, network switch, etc.
	All Security CCTV cameras shall be decommissioned by the TISC and shall not be replaced.
	Travel time sites shall be decommissioned as indicated in Appendix C: Existing Infrastructure Tables, 85A_TT and 85B_TT.
	All conduits at decommissioned sites shall have all cables/wires removed by the TISC.
	When decommissioning any sites that have no devices still present, the TISC shall remove the lateral fiber drop to the location and splice the main trunk line.
	In the event that decommissioning a site requires the removal of the roadside cabinet, the lateral fiber run from the cabinet to the trunkline must be removed and respliced at the main trunkline.

#### 2.1.2.3 Traffic Control and Maintenance of Traffic

The following details the requirements for all traffic control and maintenance of traffic on the GDOT/ SRTA facilities:

No.	Traffic Control and Maintenance of Traffic Requirements
	The TISC shall cooperate with GDOT and SRTA to minimize the required number of lane closures.
	The TISC shall transmit all lane closure requests to GDOT and SRTA for approval.
	The TISC shall transmit the Traffic Control Plans to SRTA for approval.
	The TISC shall work with GDOT and SRTA and agree to a reasonable plan for scheduling and approving lane closures, including a procedure for advance notice of cancellations of lane closures and allowable conditions for such cancellations.
	The TISC shall be responsible for administering all lane closures and traffic controls during the installation and for all the testing through system acceptance.
	The TISC shall be responsible for any lane closures on the general-purpose lanes, Arterials, or the Express Lanes to conduct its work.
	Toll system and ITS commissioning shall be scheduled to minimize traffic delays during the installation process.
	The TISC shall make every effort to schedule work around peak traffic movement times.
	For all lane closures, the TISC shall conform to the latest versions of the GDOT Standard Specifications as provided in Section 150: Traffic control. The document can be found under: <a href="https://www.dot.ga.gov/PartnerSmart/Business/Source/specs/2021StandardSpecifications.pdf">https://www.dot.ga.gov/PartnerSmart/Business/Source/specs/2021StandardSpecifications.pdf</a> .
	For all lane closures, the TISC shall conform to the provisions of in Attachment 7: Traffic Controls.



No.	Traffic Control and Maintenance of Traffic Requirements
	The closure schedule request shall show the locations and times of the proposed closures.
	The closure schedule shall be submitted in the format requested by GDOT and SRTA and must be made in accordance with lane closure requirements and in observation of the lane closure restriction for designated holidays.
	Closure schedule requests submitted to GDOT and SRTA with incomplete or inaccurate information shall be rejected and returned for correction and resubmittal.
	The TISC shall be notified by GDOT and/or SRTA of disapproved closures or closures that require coordination with other parties as a condition of approval.
	Closure schedule request amendments, including adding additional closures, shall be submitted in writing, at least three (3) Business Days in advance of a planned closure.
	Approval of closure schedule amendments shall be at the discretion of GDOT/SRTA.
	GDOT/SRTA will be notified of canceled closures two (2) Business Days before the date of the closure.
	Closures that are canceled due to unsuitable weather may be rescheduled at the discretion of GDOT/SRTA.
	Any work involving removal/relocation of Equipment (both existing Equipment and the TISC's Equipment), loosening or removal of nuts/screws, cables, connectors, etc., shall be done with appropriate lane closures during a nighttime period or off-peak hours and in accordance with GDOT/SRTA approved lane closures.

### 2.1.3 Roadside Functional Requirements

The following section defines all the requirements associated with the Roadside Toll Collection System.

#### 2.1.3.1 Toll Point Functional Requirements

For SRTA's exiting toll facilities, the functional requirements for Toll Points vary by toll facility.

For both facilities, TRDMS signs at the entry point display the rate from that point to a specified exit point. The rate on the TRDMS at the time of vehicle entry is the assigned trip rate.

For I-85 facilities, Toll Points are placed roughly every half mile in the mainline. The functional approach to assessing tolls for these facilities is based on building trips from transactions captured from mainline gantries, then assigning the toll rate based on where the trip began and ended using defined pricing segments.

For I-75 facilities, Toll Points are placed at entry and exit points of the roadway, automated to function properly in either direction for the reversible facilities. In the I-75 facilities, trips are built from transactions captured at entry and exit toll points.

The following requirements apply to Toll Points in all facilities:

No.	General Toll Point requirements
	The TISC shall design, procure, install, test, configure, integrate, operate, and maintain all servers, storage, and network equipment needed to support the software that meets SRTA performance and functionality requirements of this RFP.

No.	General Toll Point requirements
	The TISC shall procure all Tolling devices, equipment, electronics, hardware, software, switches, cabling, connectors, brackets, enclosures, and any other ancillary hardware required to design, develop, test, implement and operate the ETCS roadside system as identified in this RFP.
	The TISC shall furnish, mobilize, and secure all required facilities, equipment, and resources necessary for initiating and concluding the Contract.
	All environmental sensors implemented by the TISC shall be integrated into the MOMS and shall provide configurable notifications and alerts.
	All HVAC, UPS, generators, and cabinet access shall be integrated into the MOMS and shall provide configurable notifications and alerts.
	Each Toll Point shall include at least the following: <ol style="list-style-type: none"> <li>1. Zone Controller(s).</li> <li>2. AVI System, including antennas and readers.</li> <li>3. Video Toll System.</li> <li>4. AVDC System.</li> <li>5. DVAS Cameras.</li> <li>6. Network Switches.</li> <li>7. UPS.</li> <li>8. Microwave units (I-85 only).</li> </ol>
	The TISC shall equip and configure Toll Points based on the detailed road and lane configurations as shown in in Appendix B: Single Line Diagrams, and the associated tables found in this document.

The following requirements apply to I-75 Toll Points only:

No.	I-75 Toll Points Requirements
	<p>On the I-75 facility, travel lanes and shoulder lanes that are 10 feet wide or greater shall be fully equipped, shoulder lanes that are greater than four feet wide but less than 10 feet wide shall be partially equipped, and shoulder lanes less than or equal to four feet wide shall not be equipped. The TISC shall refer to Appendix C: Existing Infrastructure Tables for details of each Toll Point by facility.</p> <p>Fully equipped means that the travel lane shall include AVI, AVDC, VES, and DVAS.</p> <p>Partially equipped means that the shoulder lane shall include AVDC and VES.</p>
	Reversible Toll Points on the I-75 facilities shall be capable of collecting transactions in both directions. This reversibility shall be implemented by way of a series of reversal commands received at the Toll Point from the TFH. See section 2.2.5.11 Roadway Reversal Functionality in the TFH Functional Requirements for details on TFH reversibility requirements.
	Toll Points on the I-75 facilities shall detect Wrong Way Vehicles (WWV) on a Toll Point by Toll Point basis based on operational travel direction.
	Toll Points on the I-75 facilities shall transmit WWV detections as alarm messages to the TFH within 3 seconds of detection, including date, time, location, direction of WW travel, and any

No.	I-75 Toll Points Requirements
	other vehicle information available from the toll system such as transponder read, images, classification.

### 2.1.3.2 Zone Controller Requirements

The General Zone Controller requirements are as follows:

No.	Zone Controller Requirements
	The TISC shall provide redundant Zone Controller functionality for all Toll Points.
	The Zone Controller shall process data obtained from the AVI, AVDC, and VTS equipment, along with other sensors and subsystems to generate a Transaction for each passing vehicle.
	The Zone Controller shall be able to process Transaction volumes of at least 3,000 vehicles per lane per hour.
	The Zone Controller shall meet all applicable SLAs, as described in Appendix E: Service Level Agreements.

#### 2.1.3.2.1 Zone Controller Software

The Zone Controller will include numerous types of software to include operating systems, databases, COTS software, and ETCS software.

The Zone Controller software requirements are as follows:

No.	Zone Controller Software Requirements
	The Zone Controller operating systems, databases, COTS software, and ETCS software provided by the TISC shall support near real time Transaction creation.
	The proposed operating systems and databases shall be currently supported versions/releases (no Beta releases) with a documented upgrade path.
	The message protocol between the Zone Controller and the VTS, AVI, and AVDC subsystems shall be documented and included in the DDD.
	The RSE shall include a Web-based GUI that provides the ability for authorized users to monitor roadside equipment hardware and software status; download configuration files; update Zone Controller executables; reverse a toll point on a facility with reversible lanes; place a toll point in maintenance mode during which all transactions and faults generated are discarded and not sent to the TFH; and view transactions and images along with any accompanying detail data.
	One Zone Controller software version shall be used for all Toll Points of a single roadway.
	The Zone Controller software shall be parameter driven and configurable to provide for unique conditions at each Toll Point (for example: number of lanes, cameras, readers, and reversibility) and for different operating modes.

### 2.1.3.2.2 Transaction Processing

The Zone Controller is required to be a high-performance transaction processing solution that collects and processes all transactions at each Toll Point. The Zone Controller Transaction Processing requirements are as follows:

No.	Zone Controller Transaction Processing Requirements
	The Zone Controller shall detect, classify, and frame vehicles, and associate all Transactions (including those with valid transponders) with VES images.
	The Zone Controller shall assign transponder reads accurately to the correct vehicle
	For vehicles that have multiple transponders mounted, the Zone Controller shall accurately associate the multiple transponders reads reported by the AVI System to the correct vehicle, and the transponders shall be included as part of the vehicle Transaction to be transferred to the TFH.
	Each Transaction formed by the Zone Controllers shall be assigned a unique identifier.
	<p>The Zone Controllers shall include at least the following in each Transaction:</p> <ol style="list-style-type: none"> <li>1. Unique Transaction Identification Number.</li> <li>2. Facility.</li> <li>3. Direction of Travel.</li> <li>4. Tolling Point.</li> <li>5. Lane.</li> <li>6. Transaction Date.</li> <li>7. Transaction Time.</li> <li>8. Transponder ID(s) (if available).</li> <li>9. Transponder Type (if available).</li> <li>10. Transponder Agency ID (if available).</li> <li>11. RFID Handshake Count (if available).</li> <li>12. Vehicle Class (if available).</li> <li>13. Speed.</li> <li>14. Link to associated VTS Images.</li> <li>15. Equipment Status Code(s).</li> <li>16. Cloned transponder flag.</li> <li>17. Wrong way vehicle flag.</li> <li>18. Image quality indicator (e.g., ALPR confidence level).</li> </ol>
	The detailed Transaction processing rules, including processing rules for incomplete Transactions and multiple tag reads per vehicle, and all Transaction details shall be finalized during the Design Phase.
	The TISC shall implement algorithms for transponder data validation and authentication such that potential “cloned” transponders are identified and flagged for processing/reporting in the TFH. SRTA will provide the TISC with the Hash Key that is required for this validation.
	The TISC shall implement ISO 18000-63 protocol (6C) transponder validation described in section 6.4 of the 6C Coalition’s AVI Standard Documentation version 3.2 available at: <a href="http://6c-toc.com">http://6c-toc.com</a> .

No.	Zone Controller Transaction Processing Requirements
	For all Toll Points, the Zone Controllers shall associate images of vehicles with the correct Transaction according to the SLAs in Appendix E: Service Level Agreements.
	One and only one transaction shall be created for each vehicle that travels through a Toll Point.
	Zone Controllers shall write health status codes to Transactions based on the status of the various equipment and devices (i.e., AVDC, VES, AVI) at each Toll Point when the transaction is built, indicating a degraded state if there are equipment issues.
	Zone Controllers shall ensure all available input data has been written to the transaction prior to transmitting it to the TFH.

#### 2.1.3.2.3 Redundancy and Failovers

The requirements for redundancy and failover for Zone Controllers are as follows:

No.	Redundancy and Failover Requirements
	The Zone controllers shall be designed and deployed in a redundant configuration such that a separate Zone Controller instance using separate hardware automatically assumes the functions of the Zone Controller in the event the primary unit should fail (i.e., automatic failover).
	An Alert shall be generated and transmitted to the MOMS whenever a Zone Controller failover or Zone Controller outage event occurs.
	The Zone Controller failover system shall ensure no loss of data, transactions, or revenue due to a single hardware failure.
	Failover of a single Zone Controller shall not disrupt the ongoing operation of the remaining system(s) at any Toll Point or Facility.

#### 2.1.3.2.4 Zone Controller Start-Up

The requirements for Zone Controller Start-up are as follows:

No.	Zone Controller Start-Up Requirements
	The Zone Controllers shall have start up procedures for initialization and for self-diagnostic test sequences.
	Alarm messages related to the Zone Controller start-up procedures shall be reported to the MOMS.
	The Zone Controllers shall automatically start-up in the same mode and direction of travel configuration which was set/active prior to shut down.

#### 2.1.3.2.5 Interface to Toll Facility Host (TFH)

The requirements for Interface to the TFH are as follows:

No.	Interface to Toll Facility Host Requirements
	The Zone Controllers shall interface with the TFH for the automatic transfer of all transactions and their associated data and images to the TFH.
	The transmission of Transactions from the Zone Controller to the Toll Facility Host shall use a documented and non-proprietary protocol with guaranteed delivery.
	All Transactions, images, files, and messages shall be confirmed as having been received by the TFH (i.e., ACK'd) before they are eligible for removal at the Zone Controller level.
	The Zone Controllers shall be capable of receiving files, tables, and messages from the TFH or, in the case of a communication failure, via local download.
	Receipt of all data between the Zone Controllers and the TFH will be acknowledged such that any data not received can be retransmitted and reported on.
	Any failures in the transmission of Transactions, files, messages and/or data to the TFH shall be reported to the MOMS.

#### 2.1.3.2.6 Standalone Operation

The requirements for Standalone Operation are as follows:

No.	Standalone Operation Requirements
	Zone Controllers shall be capable of operating in a standalone mode if communication between the Zone Controller and TFH is down.
	When operating in this mode, the last configuration, security access, and application files downloaded from the TFH shall be used until communication is restored or files are uploaded locally.
	Upon restoring communication with the TFH all back-logged messages shall be transmitted without affecting lane operations or transmission of newly created transactions.
	The Zone Controller shall be capable of storing all transaction information including images collected while in standalone mode for a minimum of thirty (30) days.
	In the event of an extended communication failure, the Zone Controller shall be designed to permit secure download of un-sent transactions and image data or upload of configuration, security access or application files from an external source.
	The TZC shall ensure that transactions created while operating in standalone mode are not duplicated when normal operations resume.

#### 2.1.3.2.7 Time Synchronization

The requirements for time synchronization for the Zone Controllers are as follows:

No.	Zone Controller Time Synchronization Requirements
	Zone Controllers shall be time synchronized to the TFH at the time of Zone Controller startup and every 15 minutes thereafter.

No.	Zone Controller Time Synchronization Requirements
	The Zone Controller shall synchronize or transmit time synchronization messages with every connected Toll Point subsystem or equipment capable of maintaining time.
	Time shall be synchronized to the nearest msec.
	MOMS shall be notified and create an alert if a time synch issue is detected.
	Upon start-up Zone Controller shall resync time to the TFH.

### 2.1.3.3 Automated Vehicle Identification (AVI) System Requirements

The SRTA ETCS solution is to include an Automated Vehicle Identification (AVI) system equipped with several components to provide for automated, effective, efficient, and interoperable identification of vehicles traversing SRTA toll facilities. The requirements for the AVI system are as follows:

No.	Automatic Vehicle Identification (AVI) Requirements
	The ETCS shall include an Automated Vehicle Identification (AVI) subsystem with multiprotocol radio frequency (RF) readers and antennas, processing both SRTA and other toll transponders.
	The Automated Vehicle Identification (AVI) subsystem equipment shall be certified by EZPass.
	The AVI antennas shall be placed such that the AVI system shall be able to read transponders on vehicles traveling through any area of the Toll Point, including but not limited to, center of lane, changing lanes, straddling lanes, and straddling shoulder with no degradation of performance or interference.
	For each individual vehicle, up to two (2) transponders shall be read in accordance with the SLA requirement(s) and these transponders will be processed and reported in that vehicle's Transaction(s) in the following order: <ol style="list-style-type: none"> <li>1. Valid home agency (i.e., Peach Pass) transponder (if multiple valid home agency transponders, order transponder entries by number of handshakes).</li> <li>2. Valid interoperable transponder (if multiple valid interoperable transponders, order transponder by number of handshakes).</li> <li>3. Invalid home agency (i.e., Peach Pass) transponder (if multiple invalid home agency transponders, order transponder entries by number of handshakes).</li> <li>4. Invalid interoperable transponder (if multiple invalid interoperable transponders, order transponder by number of handshakes).</li> </ol>
	The AVI subsystem shall be required to concurrently read and report all Transponder data encoded on transponders (including single and multi-protocol transponders) supporting the following three protocols: <ol style="list-style-type: none"> <li>1. ISO 18000-63 ("6C") as described in the 6C Coalition's <i>AVI Standard</i> document: <ol style="list-style-type: none"> <li>a. SRTA requires the full TID and UID/EPC values to be read/reported.</li> <li>b. SRTA has issued Transponders programmed to the V0.9 and V3.1 versions of the 6C Coalition specification. Both memory maps must be properly read, decoded, and reported by the AVI subsystem concurrently.</li> </ol> </li> <li>2. TransCore SeGo® protocol as described in TransCore's <i>SeGo Protocol Specification</i> document.</li> </ol>

No.	Automatic Vehicle Identification (AVI) Requirements
	3. Kapsch's TDM protocol as described in Kapsch's Active TDM Over-Air Specification for Electronic Toll Communications document.
	The AVI subsystem shall correctly perform the UII validation described in the 6C Coalition's AVI Standard document. The result of this validation (Pass/Fail) will be included with each 6C Transponder's data packets to allow alerts and reports to be generated by upstream systems (e.g., Toll Facility Host).
	The AVI subsystem shall not write to any transponders.
	For testing purposes, SRTA will provide Peach Pass transponders and the TISC shall be responsible for providing IAG and other partner agency eGo® Plus transponders.
	The TISC shall provide certification during the Preliminary Design Review (PDR) that any new proposed reader's 6C capabilities have been certified by an approved independent third-party laboratory (Certification under the OmniAir Certification Services' ISO 18000-6C Certification Program will satisfy this requirement).

#### 2.1.3.3.1 AVI Federal Communication Commission Licensing

The requirements for FCC Licensing are as follows:

No.	FCC Licensing Requirements
	The TISC shall complete, compile and maintain all Federal Communication Commission (FCC) licensing materials for all toll points.
	The TISC shall provide AVI location and support structure information in compliance with FCC standards.
	The TISC shall complete an RF survey at each location to determine if there is any presence of any competing RF signals which may impact the accuracy of the TISC provided RF equipment.
	If outside sources of RF signals are present, it is the responsibility of the TISC to validate the location of the source and work with SRTA to remedy the situation if the source has been determined to have a negative impact to the system performance.
	The TISC shall provide the completed FCC form(s) to SRTA for submission to the FCC.
	The TISC shall be responsible for providing FCC required information to SRTA as requested for the duration of the contract.

#### 2.1.3.4 Video Toll System (VTS) Requirements

The requirements for Video Toll System (VTS) requirements are as follows:

No.	Video Toll System (VTS) Requirements
	The VTS shall capture the correct images with all Transactions (including those with transponders).
	The VTS shall capture images of the rear license plate, including the entire rear profile of the vehicle, for all vehicles that traverse a Toll Point.



No.	Video Toll System (VTS) Requirements
	For reversible facilities the VTS shall capture images of both the rear and the front license plates of each vehicle that traverse a Toll Point.
	The VTS shall capture images with resolution that provide a human recognizable image of the vehicle and the license plate when printed on violation notices.
	VTS images shall be stored locally until successful image transmission to the applicable long term storage location for image review.
	The VTS shall send alarm messages to MOMS that indicate if the image quality of a VTS camera has degraded based on multiple indicators, including the rolling average of a configurable number of images, or a camera is producing black (no picture) images, low confidence, or no APLR/OCR result.
	All VTS cameras and illuminators shall be the same make and model in all lanes.

#### 2.1.3.4.1 VTS Cameras and Illumination

The requirements for VTS Camera and Illumination are as follows:

No.	VTS Camera and Illumination Requirements
	The VTS cameras and illuminators shall support a minimum capture rate of no fewer than four vehicles per second.
	<p>All VTS cameras installations shall provide for the following:</p> <ol style="list-style-type: none"> <li>1. Full color images.</li> <li>2. Resolution of minimum 150DPI across the plate image.</li> <li>3. Image capture of all vehicle license plates with sufficient sharpness to automatically extract the plate number, type, and state jurisdiction in compliance with the performance requirements in Appendix E: Service Level Agreements.</li> <li>4. Image capture of human readable images of legally mounted Georgia temporary paper plates during daylight hours.</li> <li>5. Camera illumination mounted/installed in such a way as to prevent distracting or affecting the vision of drivers (Use of filters and/or shrouds may be required if it is determined the lighting is intrusive to the drivers).</li> </ol>
	Should the TISC elect to mount VTS components on new support structures, TISC shall be responsible for all structural engineering and design, procurement of materials, and installation and maintenance of all assemblies.
	The TISC is required to submit shop drawings, for SRTA approval, prior to installation of such equipment.
	VTS cameras shall be mounted overhead for all Toll Points.
	VTS cameras shall be mounted, configured, and/or triggered to prevent capture of images of motorists' faces.

#### 2.1.3.5 Vehicle Detection, Separation, and Classification System Requirements

The TISC is to provide an Automated Vehicle Detection and Classification System (AVDC) that detects, separates, and classifies vehicles that are travelling through a Toll Point. The I-75 and I-85 SRTA facilities have two different AVDC solutions currently installed. I-75 is equipped with a smart loop subsystem that also includes axle counting loops, trigger loops and overhead vehicle laser profilers. I-85 only uses positional sensor loops for transaction formation and camera triggering but does not detect axles. For this project SRTA is requiring a Volumetric approach that would replace the current axle-based vehicle classification system with a profile-based system based on the vehicle's height, width, length and if required, profile data points. The new AVDC system proposed by the TISC may employ the use of existing and/or new roadway embedded sensors/inductive loops if deemed necessary by the TISC to meet the requirements for AVC accuracy levels. The volumetric approach would require vehicles to be classified by size, or the "box" they would fit within. The actual "box" sizes would be determined by SRTA with collaboration of the TISC during the design phase. The new AVDC system shall at a minimum meet the requirements listed in the table below:

No.	Vehicle Detection, Separation, and Classification System Requirements
	The AVDC system shall detect, separate, and classify all vehicles traveling through a Toll Point for all ETCS facilities, including all areas of the toll point and shoulder.
	The AVDC system shall be configurable to allow for a minimum of five (5) volumetric classes to be established during the design phase.
	The AVDC System shall assign the proper volumetric class to the associated vehicle per the SLA's as defined in Appendix E: Service Level Agreements.
	The AVDC shall detect trailer hitches to ensure that vehicles with a trailer/tow are classified as one unit (axles combined).
	The AVDC subsystem shall provide vehicle event messages and signals to the Zone Controller.
	The status of the AVDC system shall be reported to the MOMS.
	The AVDC shall detect vehicles moving in the wrong direction and notify the TFH through the Zone Controller within ten (10) seconds of a Wrong Way Vehicle detection.
	The AVDC system shall detect and report the speed of each vehicle to the Zone Controller.

#### 2.1.3.6 Toll Rate Dynamic Message Sign (TRDMS) Functional Requirements

Toll Rate Dynamic Message Signs are deployed on the SRTA ETCS facilities to provide real time toll rate information to the travelers on SRTA's facilities. While most requirements for this system are to be consistent across all facilities, there are a few that are unique to specific facilities. The requirements associated with the TRDMS system are as follows:

##### 2.1.3.6.1 General TRDMS Requirements

The general requirements associated with the TRDMS that apply to both I-85 and I-75 are as follows:

No.	Vehicle Detection, Separation, and Classification System Requirements
	For all new signs provided, the TISC shall furnish, install, configure, test, and maintain the TRDMS in accordance with GDOT Standards and manufacturer requirements.

No.	Vehicle Detection, Separation, and Classification System Requirements
	The TISC shall provide the TRDMS in accordance with the GDOT Standard: 631- Dynamic Message Signs, GDOT ITS Design Manual which can be found under: <a href="https://www.dot.ga.gov/PartnerSmart/Business/Source/specs/2021StandardSpecifications.pdf">https://www.dot.ga.gov/PartnerSmart/Business/Source/specs/2021StandardSpecifications.pdf</a> TISC-provided TRDMS suppliers shall be listed on GDOT's Transportation Products - Qualified Products List (QPL).
	The TRDMS shall employ full color, full matrix LED DMS inserts within a static sign panel.
	The TRDMS shall be capable of displaying both text and SRTA approved graphical images and shapes.
	The TRDMS shall comply with the requirements outlined in the MUTCD, Chapters 2F and 2L.
	All TRDMSs shall be able to display toll rate messages or configurable alphanumeric messages.
	All TRDMSs shall be able to display messages with the number of characters as defined in Appendix C: Existing Infrastructure Tables.
	All arterial TRDMSs that support reversible facilities shall display a configurable toll rate message containing a destination and its associated toll rate.
	The NTP Time synchronization source for TRDMS shall be the TFH.
	If any TRDMS loses communication with the TFH, an alert shall be generated in MOMS and notification sent to a configured list of users.
	Each TRDMS shall utilize the last posted message on the sign for a configurable amount of time when the TRDMS loses communication with the TFH before it turns "blank". Time shall be remotely configurable by facility.
	The TRDMS controllers shall be capable of localized override commands to display pricing or other messages in situations where communication with the CPS or TFH may be lost.
	The system shall log all localized override commands for rating or re-rating trips.
	The TRDMS shall implement NTCIP to facilitate confirmation of the actual message displayed on the sign.

#### 2.1.3.6.2 I-75 TRDMS Requirements

For TRDMS signs in the I-75 TSI toll facility, GDOT's Reversible Access Control System (RACS) provides a hard-wired connection between the RACS controller cabinet and the Toll Rate DMS controller cabinet. This hard-wired connection communicates the position of a RACS "override" switch to the TRDMS controller. This "override" switch allows GDOT maintenance personnel to override the message currently displayed on the TRDMS (e.g., during manual reversal operations). The switch will be in the default "Normal" position during normal operations.

In addition to the general TRDMS requirements stated in section 2.1.3.6.1 above, I-75 specific TRDMS requirements are as follows:

No.	I-75 TRDMS Specific Requirements
	The TRDMS shall display the correct rates in the appropriate direction of travel for reversible facilities as described in Attachment 5: Reversal Scenarios.
	The TRDMS shall interface with the RACS “override” switch to display a message corresponding to the switch position. The “override” switch position will indicate if Open; Closed; minimum toll rate determined by SRTA: or a SRTA configurable message is to be displayed.
	Activation of the “override” switch, i.e., selection of a message associated with any switch position other than “Normal”, shall override any existing or default messages currently being displayed on the TRDMS.
	As long as the “override” switch is in any position other than “Normal”, the TRDMS shall display only the message associated with the selected switch position.
	The TRDMS shall display messages as described in Table [] <sup>2</sup> below, based on the position of the “override” switch provided by GDOT.
	The TRDMS shall display the message output based on the override switch position until a higher priority message is sent to the sign for display.
	Anytime the “override” switch is utilized, the TRDMS shall generate a message to the TFH communicating the position of the switch.
	Anytime the “override” switch is utilized, the ETCS shall generate a message to the Toll Operation Center System (TOCS) Interface and to the GDOT TMC communicating the position of the switch.

#### 2.1.3.7 Travel Time Sites Functional Requirements

Travel Time sites are sites on the roadway with AVI subsystems installed to collect transponder reads from GP lanes or the arterial roads providing access to the Express Lanes. Travel time sites are to be co-located with existing TRDMS sites, as well as at other designated locations as indicated in Appendix C: Existing Infrastructure Tables. The purpose of Travel Time Sites is to provide data such as transponder penetration, GP lane travel times, and timing for rate calculations to the ETCS.

The requirements for all travel time sites in the existing TSI toll facilities are as follows:

No.	Travel Time Sites Functional Requirement
	Travel Time Sites on arterial roadways shall provide coverage as required by the quantities listed in Appendix C: Existing Infrastructure Tables.
	Travel Time AVI sites that are on mainlines shall provide coverage as required by the quantities listed in Appendix C: Existing Infrastructure Tables.
	Travel Time AVI equipment shall have the ability to read all transponder protocols.
	Data collected from Travel Time Sites should include, at minimum:

<sup>2</sup> Table shall be included in the next version of this document.

No.	Travel Time Sites Functional Requirement
	Transponder Detection Datetime, Facility, Travel Time Site ID, Antenna ID, Transponder ID, Transponder Agency, Transponder Protocol, and AVI Poll Count.
	All data collected from Travel Time Sites shall be transmitted in near real-time to the TFH.
	The NTP Time synchronization source of Travel Time AVI equipment shall be the TFH.

#### 2.1.3.8 CCTV Camera Functional Requirements

A comprehensive CCTV camera system is required along all SRTA toll facilities to observe the Toll Rate TRDMS messages, to observe roadway and traffic conditions, and to provide audit capabilities when utilizing the Digital Video Audit System (DVAS). Refer to Appendix C: Existing Infrastructure Tables Existing Infrastructure Tables and Appendix B: Single Lane Diagrams, for locations of existing CCTV camera components and support structures. The functional requirements for all CCTV Cameras are as follows:

No.	CCTV Functional Requirements
	The TISC shall furnish and install CCTV cameras, mounting brackets, cabling, and controls for all locations where there are currently SRTA operated CCTV cameras (not including Security CCTV cameras).
	The TISC shall adhere to the requirements and guidelines in section 936 of the GDOT Standard Specifications document found in: <a href="https://www.dot.ga.gov/PartnerSmart/Business/Source/specs/2021StandardSpecifications.pdf">https://www.dot.ga.gov/PartnerSmart/Business/Source/specs/2021StandardSpecifications.pdf</a> , for the procurement, installation, and maintenance of CCTV cameras.
	All CCTV cameras shall meet performance and availability levels as required by Appendix E: Service Level Agreements (SLAs).
	<p>All CCTV cameras shall provide the following:</p> <ol style="list-style-type: none"> <li>1. Day (color)/night (monochrome) switchover and iris control, with secure, user-selectable manual and automatic control capabilities.</li> <li>2. Titling &amp; Masking features.</li> <li>3. Programmable preset titles for each preset position, and programmable privacy zones.</li> <li>4. IP Addressable.</li> <li>5. Digital high-definition resolution (1280 x 720 as a minimum) full color.</li> <li>6. Automatic focus and iris control.</li> <li>7. Minimum 24X motorized automatic optical zoom lens with optical iris.</li> <li>8. Maximum aperture of at least f/1.6.</li> <li>9. Operation in ambient light for Day/night conditions.</li> <li>10. Capable of remote firmware upgrade via the communication interface.</li> <li>11. H.264 / MPEG-4 Part 10 video compression.</li> </ol>
	<p>Video Encoding for all CCTV cameras shall include:</p> <ol style="list-style-type: none"> <li>1. H.264 Moving Picture Experts Group's MPEG4 part 10 (H.264) video compression technology.</li> <li>2. Encoded video transmitted utilizing programmable bit rates.</li> </ol>

No.	CCTV Functional Requirements
	3. Capable of delivering color and monochrome video at up to 30 frames per second (FPS) regardless of resolution.
	All CCTV cameras shall connect to the existing fiber communications network supporting all other roadside equipment.
	CCTV cameras shall be compliant with the ONVIF Profile S and Profile T interface protocols.
	All CCTV camera enclosures shall be designed and manufactured for continuous operation in all weather conditions and provide clear video and images of objects within the field of view regardless of ambient lighting (day and night) and weather conditions.
	All CCTV camera enclosures shall include a pressurized dome with low-pressure alarm, NEMA 4X/IP-67 rating, and distortion free plastic with sunshield.
	All CCTV cameras shall provide PTZ functionality.
	Failure of any CCTV camera shall generate an alert in MOMS.
	The TISC shall provide a detailed plan for the storage of CCTV video that is in accordance with Attachment 6: Data Retention Guideline, and includes at a minimum: Details of storage media that will be utilized, Format the video will be stored in, Frame rate it will be stored with.

#### 2.1.3.8.1 TRDMS CCTV Camera Requirements

TRDMS CCTV are used to verify TRDMS rates are correctly displayed and to monitor TRDMS LED performance to support maintenance. The requirements for TRDMS CCTV Cameras are as follows:

No.	TRDMS CCTV Camera Requirements
	The TISC shall provide cameras to observe all TRDMS.
	The TISC shall coordinate with SRTA to establish the camera field of view and focus providing an optimum image of the TRDMS display.
	The TRDMS CCTV field of view shall always capture the entire TRDMS (static + bricks).
	The TRDMS CCTV field of view settings shall be configured to ensure that only the TRDMS sign face is visible.
	TRDMS CCTV video shall be recorded, and the video shall be retained per Attachment 6: Data Retention Guideline.

#### 2.1.3.8.2 I-85 Traffic Surveillance CCTV Cameras Requirements

The requirements for I-85 Cameras are as follows:

No.	I-85 Traffic Surveillance CCTV Camera Requirements
	The TISC shall provide Traffic Surveillance CCTV cameras to monitor traffic operations and identify and assess traffic incidents.

No.	I-85 Traffic Surveillance CCTV Camera Requirements
	Along I-85A, the TISC shall specify PTZ Traffic Surveillance CCTV cameras, which, by utilizing their PTZ functionality shall provide full video coverage of the facility.
	Along I-85B, the TISC shall specify PTZ Traffic Surveillance CCTV cameras, which, by utilizing their PTZ functionality can provide the same or better video coverage of the facility than the coverage achieved with the currently installed CCTV system.
	The TISC design for installation and placement of Traffic Surveillance CCTV cameras and the chosen camera specifications shall ensure best possible coverage without the addition of new infrastructure.
	The TISC shall coordinate with SRTA to establish initial camera field of view and preset conditions.
	Traffic Surveillance CCTV Cameras should not be recorded.
	The TISC shall not remove any Traffic Surveillance CCTV camera without prior SRTA approval.

#### 2.1.3.8.3 Digital Video Audit System (DVAS) Requirements

The requirements for the Digital Video Audit System (DVAS) are as follows:

No.	Digital Video Audit System Requirements
	The TISC shall provide a DVAS that enables SRTA to perform video audits on all Toll Points, and to review video of all vehicles including wrong way vehicles, along with events and/or incidents in the express lanes and partially equipped shoulders.
	The DVAS system shall support up to 5 concurrent SRTA users.
	The DVAS shall interface with Zone Controllers and other RSE devices to provide the following data elements for display during video playback: <ol style="list-style-type: none"> <li>4. Location (plaza/gantry/lane).</li> <li>5. Date/Time (in EST).</li> <li>6. Transponder number.</li> <li>7. Vehicle Classification.</li> <li>8. Link to VES Image(s).</li> <li>9. ALPR state and registration results, if known.</li> </ol>
	DVAS cameras shall be installed at each Toll Point and shall be positioned such that all vehicles exiting the Toll Point are clearly visible and the number of axles can be determined in the recorded video.
	The DVAS shall synchronize/couple and store video and corresponding transactional data such that transactional data is always available during historical video review.
	The DVAS shall allow an authorized operator/user to individually set up CCTV cameras and configure them. Configurability of settings shall be available on a per-camera basis. Only TISC maintenance personnel shall have access to set DVAS CCTV camera configuration and PTZ settings.

No.	Digital Video Audit System Requirements
	DVAS CCTV cameras shall remain in fixed positions during normal operations.
	The capability to control any DVAS CCTV cameras shall be User ID and password protected.

#### 2.1.3.9 Traffic Sensor Functional requirements

The requirements for the Traffic Sensors are as follows:

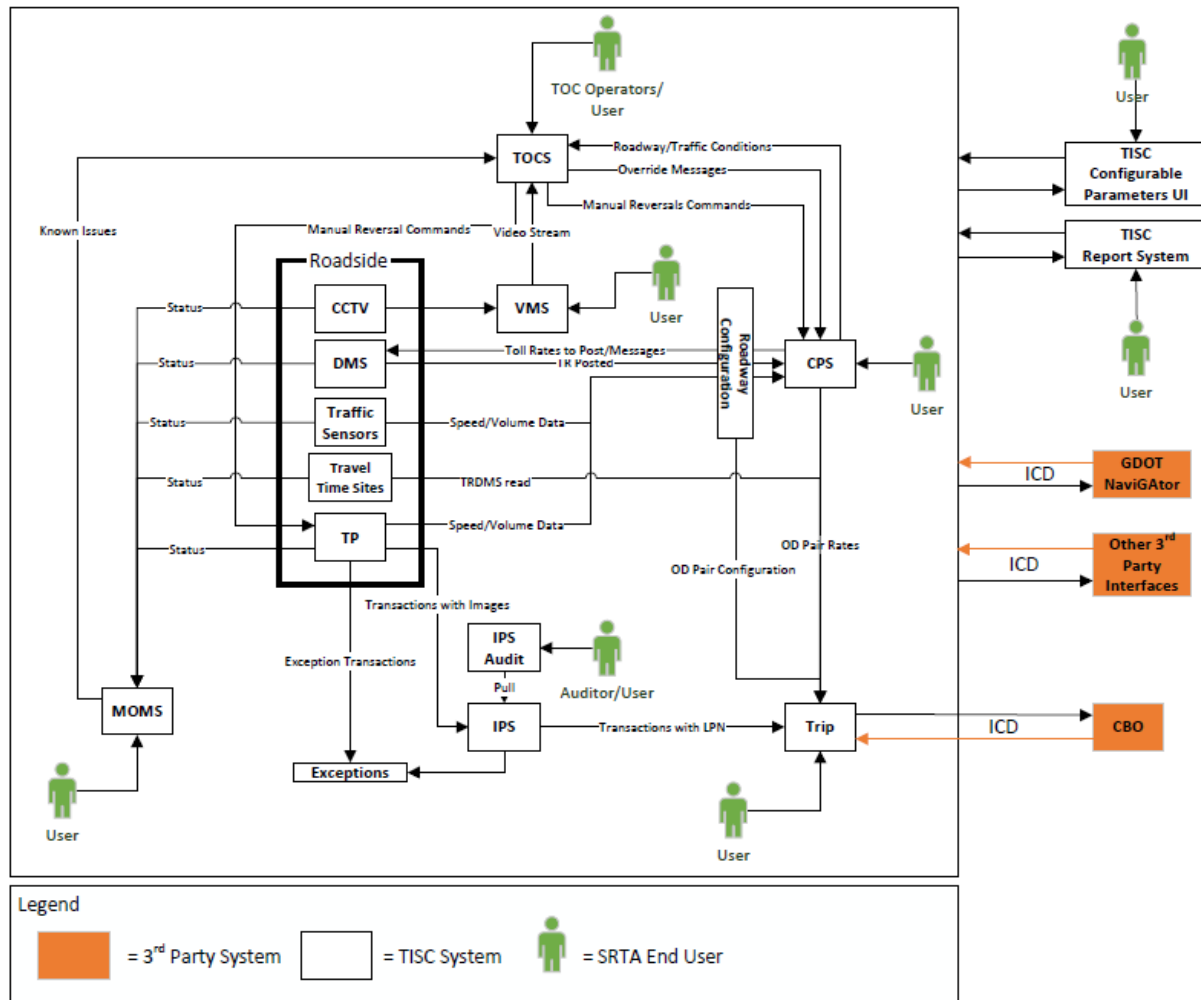
No.	Traffic Sensor Requirements
	The TISC shall install and maintain traffic sensors to measure and transmit raw traffic data in near real time to the TFH.
	The TISC shall adhere to the requirements and guidelines in section 937 of the GDOT Standard Specifications document found in: <a href="https://www.dot.ga.gov/PartnerSmart/Business/Source/specs/2021StandardSpecifications.pdf">https://www.dot.ga.gov/PartnerSmart/Business/Source/specs/2021StandardSpecifications.pdf</a> , for the procurement, installation, and maintenance of traffic sensors.
	The TISC shall operate and maintain the traffic sensors.
	The traffic sensor units shall measure and output vehicle speed, vehicle count/volume, lane occupancy, and vehicle direction.
	Traffic sensors shall provide, at a minimum, for the following: <ol style="list-style-type: none"> <li>1. Detection of vehicles in up to 22 lanes.</li> <li>2. Detection of vehicles over barriers.</li> <li>3. Detection of vehicles from between 6 ft and 250 ft away from the sensor.</li> <li>4. Per vehicle data including speed, length, class, and lane assignment.</li> <li>5. Eight (8) classification bins.</li> <li>6. 15 speed bins.</li> </ol>
	The NTP Time synchronization source for Traffic Sensors shall be the TFH.
	The TISC provided traffic sensors shall not be used for input to vehicle transactions.
	Traffic sensor data shall be time stamped with the point of capture at roadside devices, and with arrival time at any traffic server(s).
	Failure to receive data at the TFH from any traffic sensor shall result in a MOMS notification being generated.
	The TISC shall install and test all traffic sensors as defined by the manufacturer.

## 2.2 TFH Requirements

SRTA requires a Toll Facility Host (TFH) system to perform ETCS functions that meet the requirements as described herein. The TISC is responsible for all aspects of the design, development, testing, implementation and maintenance of the TFH.



The diagram below (Figure 7) represents the high-level visualization of information flow between major modules. This diagram is not meant to prescribe a system architecture. Note that not all modules, GUI's, users, or functionalities are depicted in the figure.



### Figure 10: High Level Diagram of ETCS Data Flow

### 2.2.1 General TFH Requirements

All TFH modules will be required to meet the following requirements below:

No.	General TFH Requirements
	The TFH shall use time synchronization from the National Institute of Standards and Technology (NIST).
	The TFH shall have a NIST compliant primary and back up time source.
	All references to parameters or settings that are configurable shall be configurable by an authorized SRTA user unless otherwise noted.

No.	General TFH Requirements
	The TFH shall employ web-based Graphical User Interfaces (GUI) for all functionality requiring user interactions.
	The TFH shall be compatible with the most recent release available at NTP of the following web browsers: Chrome and Edge.
	The TISC shall provide a modular TFH solution so that, if a module or any portion of the TISC infrastructure fails, the performance capabilities and functionality of the remaining modules/infrastructure will continue to function as required without degradation.
	The TISC shall ensure that no data captured and/or created during a TFH failure or recovery is compromised or lost.
	The TFH, including all subsystems, provided by the TISC shall have the ability to be expanded without major architectural modifications for handling all the required TFH functionality for additional roadside facilities that may potentially be added in the future.
	Both I-85 and I-75 roadways shall be handled/accessed under a single GUI.

### 2.2.2 TFH Hardware

The TISC is required to implement a Cloud-Based Host Solution for this Project. To support this approach the TISC will be responsible for the following TFH Hardware requirements:

No.	TFH Hardware Requirements
	The TISC shall procure and implement a secure connection via an Internet Service Provider (ISP) that will allow for communications via the WAN to the Cloud Based Hosting provider selected by the TISC.
	The TISC shall provide all Head-End network devices to allow for the physical connection of the TISC network to the Cloud Hosting provider.

### 2.2.3 Toll Operations Center (TOC) Workstation Infrastructure

	Toll Operations Center (TOC) Workstation Infrastructure
	The TISC shall provide the required workstations at the TOC for users to connect to and perform all functions required.
	The TISC shall furnish all necessary equipment to replace six existing workstations used for TOC operations.
	The TISC shall furnish and install the equipment required for workstations in a similar layout as the existing workstations.
	All servers, storage devices, UPS, and other TOC system hardware shall be installed in the designated locations within the GDOT TMC or as prescribed in the drawings supplied by and approved by SRTA and GDOT.
	The TISC shall design, furnish, and install the following for all workstations: <ol style="list-style-type: none"> <li>1. All workstations and other peripheral equipment needed to support the TOC operations.</li> <li>2. All cabling required to interface to all equipment provided by TISC.</li> </ol>

	Toll Operations Center (TOC) Workstation Infrastructure
	<ol style="list-style-type: none"> <li>3. All required equipment racks.</li> <li>4. All electronics and other devices in their respective equipment racks.</li> <li>5. All workstation monitors, PCs, and all ancillary equipment (keyboards, mice, KVM switches, cabling, monitor arms, UPS, etc.).</li> <li>6. All equipment and/or components required to connect workstations to the TOC network.</li> </ol>
	SRTA has three pods at the TMC. Each pod shall have two SRTA workstations.
	Each workstation shall be equipped with 6 monitors and all ancillary equipment required to operate the workstations.
	Each workstation monitor shall be able to display from one (1) to 16 video streams simultaneously.
	The workstations shall allow each SRTA operator to be able to individually select, display, and control 16 separate video feeds simultaneously on each monitor for up to five (5) monitors at a time (total of 80 camera views per workstation simultaneously without interruptions or lags).
	All GUI's, Dashboards and Toll applications shall be accessible and selectable on all monitors (i.e., there shall be no restrictions on simultaneous use of applications, e.g., the TFH cannot have restrictions where using the VMS application prevents another application from running).
	The TISC shall establish and validate communications to appropriate equipment and applications (e.g., TFH, GDOT ATMS, CCTV camera viewing apps, etc.) for each workstation.
	<p>The TISC shall provide the following for each workstation:</p> <ol style="list-style-type: none"> <li>1. Full Microsoft Office Professional Suite Software.</li> <li>2. Antivirus Software.</li> <li>3. Windows Updates.</li> <li>4. All other software needed to run ETCS.</li> </ol>
	During the Design Phase, the TISC shall submit the antivirus software to be installed in TOC workstations to SRTA for approval. Any changes must be resubmitted and approved by SRTA.
	<p>The TISC shall provide SRTA IT with appropriate access to the workstations such that SRTA IT can perform the following functions on the Workstations at a minimum:</p> <ol style="list-style-type: none"> <li>1. Install software (e.g., FortiClient, VLC Media Player, Google Earth, Adobe PDF viewer).</li> <li>2. Configure Remote Desktop Connections.</li> <li>3. Configure shortcuts on desktop.</li> <li>4. Restrict access to certain sites (firewall).</li> <li>5. Configure SRTA Network Drives.</li> <li>5. Connect to SRTA Printers.</li> </ol>
	The TISC shall provide a final design and diagrams that clearly illustrate all workstation positions, equipment, monitor mounting brackets, etc.

## 2.2.4 TFH Software and Hosting Solution

### 2.2.4.1 Database Management System

The TISC is required to provide a Database Management System (DBMS) that is field-proven, stable, and designed to operate in an enterprise class environment. The DBMS software will allow the ETCS end-users and applications to interact with the data generated by the ETCS. Following are the requirements for the Database Management System:

No.	Database Management System Requirements
	The TISC shall implement the ETCS with a COTS DBMS.
	All data shall be stored within the continental United States.
	The DBMS shall be compatible with the Cloud Hosting utilized by the TISC to allow memory, storage type, size, and processor capability to be scaled to meet the needs of current and future performance.
	The DBMS shall be compatible with the Cloud Hosting solution selected to ensure that the selected DBMS will be available for the life of the Contract.
	The DBMS shall be compatible with the TFH operating system and application software.
	The TISC shall provide DBMS software warranty and maintenance support services for the term of the Contract.
	The ERD for the DBMS shall be delivered in an editable electronic format.
	The ERD shall define cross schema relationships.
	The TISC shall deliver an updated ERD and Data Dictionary prior to TFH INT when transitioning existing TSI toll facilities.
	All changes made to the ERD and Data Dictionary shall adhere to the processes described in the Change Management Plan (see Section 4.3.3: Project Management Plan).

### 2.2.4.2 System Software

The TISC is responsible for providing and maintaining all software needed to implement the TFH for the ETCS. This software may be Commercial Off the Shelf (COTS) or non-COTS and shall meet the following requirements:

No.	System Software Requirements
	The TISC ETCS system shall support at least 50 simultaneous SRTA end-users (independent of the TISC users) and be able to support up to 10 additional SRTA end-users for any new ETCS facility integrated into the TFH. The system shall accommodate all simultaneous users with no degradation to performance.
	All COTS software descriptions shall include, whether it is a cloud subscription (a service in the cloud or Software as A Service (SAAS)), manufacturer, version number, lifecycle, feature set, and number of user licenses provided.
	The TISC shall obtain all necessary licenses for all COTS software used by the TISC's ETCS solution to meet the operations, maintenance, security, and performance requirements. All licensing shall be in SRTA's name or transferable to SRTA at SRTA's request.

No.	System Software Requirements
	The TISC shall obtain sufficient licenses for all COTS software to meet the quantity required for both SRTA staff and the TISC's support staff.
	The TISC shall be responsible for all COTS software related costs (e.g., licenses, ongoing maintenance/support, etc.). This includes all initial upfront costs, as well as any associated recurring renewal costs.
	<p>The TISC shall maintain a current software licensing list that is submitted annually to SRTA (or as renewal updates occur) with the pertinent licensing information, including, at minimum, the following:</p> <ol style="list-style-type: none"> <li>1. Product Name.</li> <li>2. Version Number.</li> <li>3. License Type.</li> <li>4. Duration of License.</li> <li>5. Volume of Licenses.</li> <li>6. SRTA Contact (where applicable).</li> <li>7. Product Serial Number.</li> <li>8. Proof of Purchase.</li> <li>9. License Key(s).</li> <li>10. Other documentation included with the license.</li> </ol>
	If licensing requires renewal or action on SRTA's part, then TISC shall make the request of SRTA at least 90 days prior to expiration and/or renewal date of license or product.
	The TISC shall be responsible for purchasing, maintaining, and renewing all security certificates required for the TISC's ETCS solution to meet all operations, maintenance, security, and performance requirements.

#### 2.2.4.3 TFH Operating System

The TFH Operating System shall meeting the following requirements:

No.	TFH Operating System Requirements
	The operating system for the TFH server(s)/system(s) shall consist of a COTS multi-user, multi-tasking operating system.
	The operating system for the TFH shall be the previous version if the latest version/release date is less than 12 months before the Proposal submittal date.
	The TFH operating system shall be a currently supported version with a documented upgrade path from the vendor.
	The TFH operating system shall be covered by warranty and COTS maintenance support services for the term of the Contract.
	The TISC shall maintain the operating system by installing all updates and security patches throughout the term of the Contract to meet the operations, maintenance, security, and performance requirements in compliance with SRTA Vulnerability Management policy and in coordination with SRTA IT.

#### 2.2.4.4 Cloud-based TFH Infrastructure

SRTA is transitioning away from using physical infrastructure to host the TFH and any TFH subcomponents on-site at the roadway and is choosing to implement Cloud infrastructure for TFH computing, networking, and storage resources. The Cloud provider is to provide required updates to the Cloud-based system for no additional costs. The proposed Cloud solution must be scalable to accommodate fluctuations in transaction volume. The requirements for the Cloud-based TFH Infrastructure are as follows:

No.	Cloud-based TFH Infrastructure Requirements
	The TISC shall implement a Cloud-based infrastructure to support the TFH, and all TFH subcomponents unless otherwise approved by SRTA.
	The physical location of all systems housing data related to the SRTA toll systems shall be within the 48 contiguous US states.
	The Cloud-based service must be FedRAMP authorized at the Moderate Impact Level baseline prior to being used for the Cloud-based TFH solution.
	The Cloud-based TFH infrastructure must be provisioned in a GTA-approved enterprise cloud-based environment.
	All cloud-based data related to SRTA toll systems shall have Regional Replication where, the data is housed in at least two different physical regions.
	All purging of data shall be done through cryptographic erasure.
	The TISC-provided cloud solution shall include networking infrastructure to support SRTA bandwidth and operational requirements.
	TISC shall implement encryption of data at the roadside system level and ensure all data is encrypted at rest, in use, and in transit.
	TISC shall control all encryption keys. The Cloud Provider shall not control any data encryption keys unless the Cloud provider and TISC are one and the same.
	Contracts, licensing, agreements, and SLAs between the TISC and the Cloud Provider shall be provided to SRTA for review and approval.
	The TISC shall ensure through contract, agreement, or licensing that all data within the TFH system is owned in totality by SRTA.
	TISC shall ensure through contract, agreement, or licensing that all data will be accessible for export by TISC or SRTA on request in an industry standard format.
	The TISC shall ensure the Cloud solution is scalable to accommodate fluctuation and future growth in transaction volume.
	Prior to TISC contracting with a Public Cloud Provider, the TISC shall provide to SRTA for review and approval an information security audit report for the Cloud Provider.
	The TISC shall document their approach to disaster recovery, incident response, and business continuity related to the Cloud-based services in the TISC's Disaster Recovery and/ or IT Security Plan as appropriate for SRTA to review and approve.
	The TISC shall include the approach to business continuity in the event that cloud-based services with the established Cloud Hosting Provider must be discontinued.

No.	Cloud-based TFH Infrastructure Requirements
	The contract between the TISC and the Cloud Hosting Provider shall be subject to review by SRTA and shall include clauses to permit SRTA to take over the cloud hosting contract if SRTA, in its sole determination, deems it necessary to do so in order to continue full operation of the TFH. Upon written request by SRTA, the TISC shall provide all necessary usernames, passwords, security keys, tokens or instruments to permit SRTA to continue to operate the cloud based TFH platform. All corresponding software licenses required to operate the cloud hosted platform shall be provided/granted to SRTA.
	The TISC shall address security issues specific to the use of the Cloud infrastructure within the TISC's IT Security Plan.
	All connections to the TFH and to the Cloud management controls and consoles, user interfaces and APIs shall be secured based on a Zero Trust Architecture approach and compliant with NIST SP 800-207.
	IP Enabled lockdown shall be implemented where appropriate.

#### 2.2.4.5 Additional TFH System Instances

The TISC shall account for and setup Additional TFH System Instances to provide suitable Test and Training Environments to support the Project's testing and training needs. These instances shall provide the full user functionality of the production TFH with exception of VMS and MOMs capabilities. The Additional TFH System Instances shall meet the following requirements:

No.	Cloud-based TFH Infrastructure Requirements
	The TISC shall implement a training instance of the TFH to permit training on all user interfaces without disruption of the production system.
	The training system shall be updated with the latest deployment of the production TFH software.
	The training system shall be maintained in a functional state, populated with all required test data for complete TFH training at any time.
	The TISC shall implement a testing instance of the TFH to permit testing on all system processing functions and user interfaces without disruption of the production system.
	The TISC shall provide a method for inserting transactions, images and event messages into the testing environment or a way to feed production transactions to the testing environment to allow for comprehensive testing of system changes.
	The testing and training instances shall be separate from any development testing instances maintained by the TISC for unit/ development testing.
	The TFH test and training instances may be combined into one instance, provided that such action will not create delays to the execution of the Project Schedule because of conflicting testing and training activity.

## 2.2.5 TFH Functional Requirements

### 2.2.5.1 TFH Connectivity and System Access

The TISC is expected to provide a secure TFH system that tracks individual users using the System. The TFH is to be designed and implemented to include the same sign-on so users must only provide their SRTA login credentials once to access the System per session. This includes all 3<sup>rd</sup> party COTS solutions implemented by the TISC. The requirements for the TFH system access are as follows:

No.	TFH Connectivity and System Access Requirements
	Access to the TFH, including all its modules and provided functions, shall be granted through a single set of user credentials with a single login.
	The TFH shall fully integrate with SRTA's network to ensure the TFH is accessible without a separate VPN connection when accessed through SRTA's network.
	Only authorized users shall have access to systems, interfaces, and data on the TFH.
	Access to the TFH shall be encrypted (e.g., HTTPS).
	Using a system of unique user ID and authentication controls, the TFH shall provide controlled user access to the TFH that includes Multifactor Authentication (MFA) and permission control for access to system controls, files, directories, and software applications.
	The TFH shall have "Same Sign On" capability to integrate user authentication with SRTA's Azure Active Directory authentication system including Azure AD app registration to provide for use of same user id and password.
	The TISC shall implement the TFH using a Zero Trust Architecture approach and industry-standard best practices for securing all interfaces and communications between network elements to include, but not limited to: <ol style="list-style-type: none"><li>1. Multi-factor authentication.</li><li>2. Virtual private networks.</li><li>3. Strong passwords.</li><li>4. Encryption.</li><li>5. Intrusion detection and prevention.</li></ol>
	The TISC shall design, develop, and implement the TFH utilizing a "Defense in Depth" strategy to information systems security.
	The "Defense in Depth" strategy provided by the TISC shall include: <ol style="list-style-type: none"><li>1. Intrusion detection/prevention.</li><li>2. Anti-malware.</li><li>3. Access control lists.</li><li>4. Firewalls.</li></ol>
	The TFH shall be configurable to support requests by SRTA to adjust user access levels.
	User authentication functionality shall be implemented prior to the first TFH Revenue Ready Test.
	The TFH shall be configured to use Role Based Access Control (RBAC).
	The TFH shall provide the ability to assign users to any combination of multiple roles and permissions.



No.	TFH Connectivity and System Access Requirements
	The TFH shall provide a single location for secure changes to the access levels, user roles, and the addition of personnel, for all modules and UIs.
	The TFH shall provide the functionality for authorized SRTA administrators to edit the role(s) assigned to users.
	The TFH shall allow one or more authorized SRTA administrators to add users.
	The TFH system shall provide real-time notifications to SRTA of any violations of the approved system access.
	The TISC shall develop a User Access Level Matrix during system design and submit it to SRTA for approval prior to the TFH FAT.
	A final User Access Level Matrix shall be developed by the TISC and submitted to SRTA prior to the first TFH Revenue Ready Test.
	Both submissions of the User Access Level Matrix shall be provided to SRTA for approval per Appendix H: Deliverables Schedule.
	User sign-on, access, and access failures, both local and remote, to any element of the TFH shall be recorded and tracked for security audits.
	The TFH shall monitor each user account for unauthorized access.
	The TFH shall report each access violation as a Priority Level 1 alert.
	The TFH shall notify SRTA of all access violations per NIST 800-53.
	The TFH shall log all additions and de-activation of user accounts and make that information available to SRTA upon request for review and audit.
	The TFH shall log all modifications to user access levels with the ability to provide the logs to SRTA in a readable format for review and audit upon request.
	Each TISC TFH system administrator shall have two (2) separate user accounts: <ol style="list-style-type: none"> <li>1. One of the two accounts shall be a standard user level account to be used for regular activities which do not require root or administrator level permissions.</li> <li>2. The other account shall be an administrator level account which shall ONLY be used for activities which require root or administrator level permissions.</li> </ol>
	TISC shall implement encryption of all PII or PCI data at rest and in transit, exclusive of RFID communications.
	The TISC data encryption shall meet the most recent National Institute of Standards and Technology (NIST) standards, the most current being detailed in "NIST Special Publication 800-175B Revision 1".
	The TISC shall comply with appropriate State and federal regulations, policies, standards, and guidelines that are within the Federal Information Security Management ACT (FISMA) Risk Management Framework (RMF) for the protection of SRTA and Customer's information and data.
	The TISC shall correct any security issues in accordance with SRTA's Vulnerability Management Policy and in coordination with SRTA IT staff.

### 2.2.5.2 User Interfaces

The following details the minimum requirements for all user interfaces accessed by SRTA TFH users:

No.	User Interfaces Requirements
	The TISC shall receive SRTA approval for any user interfaces from third-party products that are integrated with the TFH that do not adhere to the user interface requirements of this RFP.
	The user interface sizing shall auto adjust, based on each user's current browser and monitor resolution settings to permit a user to make maximum use of their screen size.
	The TFH GUIs shall provide consistency in the layout of menus, menu bars, navigation controls, and information presentation across all user interfaces.
	The TFH GUIs shall provide a consistent color scheme and font across all user interfaces.
	All terminology and naming conventions displayed in user interfaces shall be consistent with SRTA's terminology.
	User interfaces containing content that spans multiple pages shall be displayed and organized through pagination; e.g., if 800 rows of records are found and the user has specified display of 200 rows per page, the UI should provide 4 pages for users to click through.
	The TFH shall permit users to specify the number of rows to be displayed on a page up to all rows per page.
	The TFH shall provide pagination controls for users to skip between pages or navigate sequentially through displayed user interface content.
	For each non-reporting system interface, the TFH shall size displayed content to fit within the available display area.
	The TFH shall enable users to open at least fifteen (15) independent screens/menus concurrently.
	The TFH shall enable users to open multiple instances of the same interface via different windows or tabs in a browser and display different information on each interface.
	A loading screen/icon shall be displayed while a new user interface is loading.
	A loading screen/icon shall be displayed while search results are populating.
	A loading screen/icon shall be displayed when changing screens within a user interface.
	The system shall provide visual confirmation upon the completion of an action that results in an error.
	The visual confirmation that appears upon the completion of an action that results in an error shall require a user input to clear the message.
	The system shall provide visual confirmation upon the completion of an action that is successful.
	The visual confirmation that appears upon the completion of an action that is successful shall disappear after a configurable amount of time.
	The visual confirmation that appears upon the completion of an action that is successful shall require no user input to clear the message.

No.	User Interfaces Requirements
	Failure to perform a required action or populate a required GUI field shall return a descriptive error message.
	User interfaces displaying tabular data shall include a count of the total number of records returned that match the entered search criteria.
	All filters or search criteria fields shall have logical filtering (e.g., if facility A is chosen, only Toll Points from facility A should populate the applicable TP field).
	Filter criteria shall be capable of “AND” and “OR” conditional filters.
	All search fields shall allow partial inputs and/or wildcard inputs (e.g., searching for license plates that start with “CFC”, transponders that end in 234).
	All search fields shall allow list inputs (e.g. inputting a list of multiple license plate values and returning all Trips associated with any of the inputted plate values).
	All numeric filter criteria shall support the following comparison operators: less than, greater than, less than or equal to, greater than or equal to, between a range, equal to, and not equal to, as applicable to the filtered data.
	All datetime filter criteria shall support comparison operators such as: older than, newer than, older than or equal to, newer than or equal to, between, equal to, and not equal to.
	Date and datetime filters shall be capable of handling relative dates (e.g., Past Day, Last Two Weeks, Last Month, Last 6 same days of the week).
	All GUIs with search functionality shall have default search fields.
	Filter criteria for search functions shall be capable of being saved as a template to be used by any user.
	Filter criteria templates shall save the values selected for the filter by the original user.
	Saved filter criteria shall require a name be assigned to them by the original user.
	Saved search criteria shall be capable of being modified or deleted by users.
	If another user modifies the original filter, the user shall be required to save the changed filter with a new name.
	<p>The TFH shall provide the ability to create a filter using a combination of the following input controls as applicable to the field:</p> <ol style="list-style-type: none"> <li>1. Checkboxes: Allows the user to select one or more options from a set.</li> <li>2. Radio Buttons: Allows users to select one item at a time.</li> <li>3. Dropdown Lists: Allows users to select one item at a time with a more compact footprint.</li> <li>4. List boxes: Allows users to select multiple items with a more compact footprint.</li> <li>5. Text Fields: Allows users to enter text and specify complete or partial match.</li> <li>6. Datetime Pickers: Allows a user to select a date and/or time.</li> </ol>
	The results returned by a report or search query in a GUI shall be sortable by any displayed field.
	Displayed fields shall have a SRTA defined header value of alphanumeric character values up to 36 characters long.

No.	User Interfaces Requirements
	Displayed fields shall have the ability to be sorted in ascending or descending alphanumeric order.
	Date and datetime fields shall be sortable chronologically from oldest to newest or newest to oldest.
	All measures displayed on user interfaces shall follow US Customary units.
	All numbers displayed on user interfaces shall use decimals to represent the difference between whole numbers and fractional numbers.
	All numbers displayed in user interfaces shall use commas to separate each group of three digits in a whole number.
	The time zone used on all reports, exported data, or screens that are user/customer facing shall be Eastern Time Zone (US & Canada).
	All times displayed on user interfaces shall automatically be adjusted to UTC-5:00 when observing standard time and UTC-04:00 when observing daylight saving time.
	All datetime fields displayed in user interfaces shall be in the form of MM/DD/YYYY HH:MM:SS and follow the 24-hour clock format.
	The TFH shall display millisecond information for transactions where applicable.
	When entering information in a datetime input control, users shall select from a calendar control or type in the datetime.
	Correct unit notation shall be added to all labels, axes, and headers for all data measures in all user interfaces.
	All monetary values displayed in user interfaces shall use the US dollar currency symbol, display two decimal places, and use commas to separate each group of three digits.
	The TFH shall include a "help" button for all user interfaces that hyperlinks to a separate user interface where users can access the training materials and user manuals as described in the Section 4.9 of this RFP.
	The training materials and user manuals accessible via the help button shall be searchable by key word.
	The user support information accessible via the help button shall be consistent with the latest version of the approved training materials.

### 2.2.5.3 Transaction Processing

The minimum requirements for the processing of Transactions in the TFH are as follows:

No.	TFH Transaction Processing Requirements
	The TFH shall receive and process all Transactions and associated data sent from the Zone Controllers to be used in the Trip Building process.
	The TFH shall process transactions using a queuing logic and shall track and record the processing of each transaction through each queue.

No.	TFH Transaction Processing Requirements
	Duplicate, Wrong Way Vehicle (WWV), invalid data and incomplete Transactions shall be handled as exceptions and reported on.
	The TISC shall provide a System that can support, at minimum, the projected Transaction growth (see Appendix L: Traffic Volumes Projections) over the life of the contract.
	The TFH shall be capable of receiving and processing backlog transactions at a rate of at least seven times the normal production rate, i.e. in the event of communication loss with roadside systems, the TFH shall be able to catch up at a rate of at least one week per day.

#### 2.2.5.4 Image Processing System (IPS)

SRTA requires an Image Processing System (IPS) that will accurately and promptly identify the license plate information on every vehicle traveling through SRTA's Express Lane Facilities. The TISC is responsible for creating and processing Transaction images, including accurate assignment of a license plate result or code-off code and identification of a primary image for each Transaction. The image review results must be accurate to support SRTA Operations (e.g., notice/invoice, violation lookups, customer service calls, equipment degradation verifications). The IPS shall also include a comprehensive audit tool for SRTA to use to monitor the performance of the IPS. SRTA requires an Image Processing Search GUI to easily access Transaction images and image review results.

The general IPS requirements are as follows:

No.	Image Processing System (IPS) Requirements
	The TISC shall be responsible for all image processing to provide identification of a license plate result, which includes the license plate number (LPN), license plate jurisdiction (LPJ), and license plate type (LPT – where applicable), for all Transactions on all SRTA ETCS facilities.
	The list of plate types that the IPS shall identify and provide will be defined according to future Business Rules and are subject to change over the life of the Project based on future DMV changes.
	The system shall store all Transaction images as separate digital files, in an open-standard file architecture linked to the correct Transaction.
	The IPS shall provide the ability to assign a code-off code when the automated or manual review process fails to return a license plate number result for any image.
	All code-off codes shall be agreed upon with SRTA during the Design Phase.
	The method of assigning a code-off code when multiple reasons for failure are present in any image shall be agreed upon with SRTA to ensure system-caused and vehicle-caused errors are consistently monitored and reported.
	The TISC may use a combination of OCR/ALPR, pattern recognition and manual review provided the IPS SLAs are met. The TISC shall document the IPS business rules, confidence levels and other parameters for review by SRTA.
	The output of the IPS shall contain the following data elements for each transaction: <ol style="list-style-type: none"> <li>1. License Plate Number (LPN).</li> <li>2. License Plate Jurisdiction (LPJ).</li> </ol>

No.	Image Processing System (IPS) Requirements
	3. License Plate Type (LPT). 4. Region of Interest (ROI) coordinates. 5. License Plate Result Location (Front or Rear). 6. ALPR confidence. 7. Code-off codes (if applicable). 8. Method by which the final license plate result was obtained (e.g., human review, ALPR, or a combination of different methods). 9. The datetime at which the final license plate result was assigned to the Transaction record. 10. Data to identify primary images for use on notices.
	The IPS shall provide the logic and the data that can be used by the trip building system for the process of designating an image as the primary image or, “best image” for a transaction or set of transactions and/or a trip.

#### 2.2.5.4.1 Image Audit System (IAS)

The TFH shall include an Image Audit System (IAS) that will be used by SRTA to verify the TISC’s IPS performance by reviewing final LPN results or code-off codes for a selection of images. The TFH will provide the functions for SRTA Image Auditors and SRTA Image Audit Managers to create Audit Sets consisting of a set of images that the Image Auditors review to compare images with IPS results. For example, a SRTA Image Auditor may create an image set with 200 random images from a single toll point during peak hours on a specific day to verify IPS performance. SRTA Image Audit Managers may create Audit Sets that query audit results of two or more users to audit the performance of SRTA Image Auditors. Users will audit queried images by passing, failing, or skipping through the sample of images within an Image Set.

The requirements for the IAS are as follows:

No.	Image Audit System (IAS) Requirements
	The Detailed Design Document shall provide a description of internal IPS audit processes, systems, and procedures, including diagrams that describe internal audit process flow and any fail safes in place to ensure IPS system SLAs are being met.
	The IPS shall provide an Image Audit System (IAS) for SRTA to assess the accuracy of image review processing of all Toll Facilities.
	The IAS shall support audit functionality to measure license plate results and code-off accuracy at defined intervals or as desired by SRTA and defined during the design phase.
	The audit assignment(s), scheduling, progress, and results (partial and complete) shall be provided via dashboards and reports.
	The IAS shall have a GUI/screen to allow for the creation of Audit Sets.
	The IAS shall allow an Image Auditor or Image Audit Manager to create an Audit Set with a configurable number of random transactions with one or more of the following criteria: <ol style="list-style-type: none"> <li>1. A selectable datetime range based on Transaction datetime.</li> <li>2. Facility(s).</li> </ol>

No.	Image Audit System (IAS) Requirements
	<ul style="list-style-type: none"> <li>3. Direction(s).</li> <li>4. Toll Point(s).</li> <li>5. Lane(s).</li> <li>6. LPJ.</li> <li>7. LPT.</li> <li>8. Code-off Code(s).</li> </ul>
	The IAS shall allow an Image Audit Manager to create an Audit Set with a configurable number of random images from completed image audits performed by an Image Auditor.
	<p>An Audit Set shall be created by selecting one or more of following criteria:</p> <ul style="list-style-type: none"> <li>1. A selectable datetime range based on Transaction datetime.</li> <li>2. A selectable datetime range based on audited datetime.</li> <li>3. Facility(s).</li> <li>4. Direction(s).</li> <li>5. Toll Point(s).</li> <li>6. Lane(s).</li> <li>7. LPJ.</li> <li>8. LPT</li> <li>9. Code-off Code(s).</li> <li>10. Audit Set ID.</li> <li>11. Image Auditor (at least two auditors must be chosen for this selection to apply).</li> </ul>
	For each Audit Set created by Image Auditors or Image Audit Managers, the IAS shall store all the Audit Set creation information as a unique record for retrieval.
	The IAS shall have a GUI/screen to view all the Audit Sets in a user's Audit Set List. Audit Set Lists are a series of Audit Sets assigned to a user.
	<p>The IAS shall display the following fields for each Audit Set in a user's Audit Set List:</p> <ul style="list-style-type: none"> <li>1. Audit Set ID.</li> <li>2. Audit Set Name.</li> <li>3. Created Datetime.</li> <li>4. Last Audited Datetime.</li> <li>5. Completed Datetime.</li> <li>6. Status of the audit (in progress, completed, created): <ul style="list-style-type: none"> <li>i) In progress: Audit Reviewer started the audit and audited at least one image.</li> <li>ii) Completed: All of the images in an audit set have been audited.</li> <li>iii) Created: Audit set has been created but auditor has not started auditing.</li> </ul> </li> <li>7. Total number of images in Audit Set.</li> <li>8. Number of images audited.</li> <li>9. Number of images remaining to be audited.</li> </ul>
	The IAS shall allow users to view what filters were selected to create the Audit Set.
	The IAS shall allow IAS audit users to modify the creation criteria of Audit Sets in their Audit Set List that are in a "Created" status.

No.	Image Audit System (IAS) Requirements
	The IAS shall allow IAS audit users to only delete audit sets in their Audit Set List that they have created.
	The IAS shall denote Audit sets that have been deleted by an Image Auditor.
	The IAS shall permit authorized users to delete any Audit Sets except for Audit Sets that have been completed.
	The IAS shall allow IAS audit users to archive audit sets in their Audit Set List.
	The IAS shall hide archived audit sets from view in the audit set GUI.
	The IAS shall only allow completed audit sets to be archivable.
	The IAS shall provide a GUI/screen for audit users to process the individual images within an Audit Set.
	The IAS shall allow IAS audit users to start processing any Audit Set in their Audit Set List in any order.
	The IAS shall allow users to exit audit processing GUI/screen at any time and return to the Audit Set List Screen.
	When a user exits audit processing GUI/screen, the IAS shall save the user's progress on the Audit Set.
	The IAS shall set partially processed Audit Sets to "in-progress" status.
	The IAS shall provide an Audit Review Screen that allows the user to step through each transaction in an audit set and view all images for one Transaction together on one screen along with the IPS output data.
	The best image selected by the IPS shall be displayed in a large view in the Audit Review Screen.
	Other images associated with the Transactions shall be displayed on the same Audit Review Screen in smaller views.
	One of the images presented must be a Region of Interest (ROI) image.
	The Audit Review Screen shall allow Image Auditors to select the smaller images to enlarge that image without leaving the review screen.
	<p>The Audit Review Screen shall provide Image enhancement tools on the review audit screen to adjust the display of images including:</p> <ol style="list-style-type: none"> <li>1. Color balance of an image.</li> <li>2. Image contrast.</li> <li>3. Image exposure.</li> <li>4. Image saturation.</li> <li>5. Image brightness.</li> </ol>
	The Audit Review Screen shall allow Image Auditors to navigate through transactions such that most operator functions can be completed through a single or limited keystroke(s) and not require a mouse (e.g., the IAS will support the use of "hot" keys).
	<p>The Audit Review Screen shall display the Transaction information related to each image in the Audit Set including the following:</p> <ol style="list-style-type: none"> <li>1. Datetime.</li> </ol>



No.	Image Audit System (IAS) Requirements
	<ol style="list-style-type: none"> <li>2. Facility.</li> <li>3. Direction.</li> <li>4. Toll Point.</li> <li>5. Lane.</li> <li>6. Camera ID.</li> <li>7. Transponder ID (if available).</li> <li>8. Transponder Agency (if available).</li> <li>9. Transaction ID.</li> </ol>
	The Audit Review Screen shall display the final license plate result or code-off code with the associated image in the Audit Set.
	The Audit Review Screen shall allow Image Auditors to record a “pass” result for a Transaction/image that is presented to them and the next transaction in the set shall be displayed.
	The Audit Review Screen shall allow Image Auditors to record a “fail” result for a Transaction/image that is presented to them.
	The Audit Review Screen shall allow Image Auditors to record a “skip” result for a Transaction/image that is presented to them and the next transaction in the set shall be displayed.
	In the event an Image Auditor “fails” the IPS result for a Transaction/image, the Image Auditor shall have the option to select a failure reason code or move to the next transaction.
	Failure reason codes shall be configurable by SRTA.
	Failure reason codes shall be selected via a drop down.
	The default failure reason code in the drop down shall be a null entry.
	The Audit Review Screen shall give Image Auditors the ability to go back and edit at least the last 10 Transactions/images processed by the Image Auditor.
	The Audit Review Screen shall auto-save review results after one (1) minute of inactivity.
	The IAS shall allow IAS Image Audit Managers to assign Audit Sets to Image Auditors.
	The IAS shall provide a GUI/screen to allow users to schedule the creation of Audit Sets.
	Audit Sets created by a schedule and assigned to more than one Image Auditor shall create a unique record of the Audit Set for each Image Auditor.
	Audit Sets created by a schedule shall appear in the IAS GUI/screen of the user(s) assigned to the Audit Set(s).
	<p>The IAS shall allow audit users to schedule Audit Set creation based on relative dates from the set creation date, including the following:</p> <ol style="list-style-type: none"> <li>1. Last day.</li> <li>2. Last week.</li> <li>3. Last month.</li> <li>4. A configurable number of days/weeks/months prior to current date.</li> </ol>

No.	Image Audit System (IAS) Requirements
	The IAS shall allow an audit user to schedule the creation of Audit Sets at different frequencies, including the following: <ol style="list-style-type: none"> <li>1. Daily by time of day.</li> <li>2. Weekly by day of the week.</li> <li>3. Monthly by date of month.</li> </ol>
	The IAS shall allow audit users to configure start and end dates for an audit schedule.
	If an end date is not specified by an audit user, the audit schedule shall run indefinitely until an audit user manually ends the schedule.
	The IAS shall allow audit users to modify a schedule.
	Changes to an audit schedule shall be in effect upon the completion of the modification to the schedule.
	The IAS shall allow audit users to view schedules they created including the following schedule details: <ol style="list-style-type: none"> <li>1. Created datetime.</li> <li>2. Modified datetime.</li> <li>3. Schedule end date.</li> <li>4. Schedule details (e.g., schedule dates, frequency).</li> </ol>

#### 2.2.5.5 Transaction/Image Search GUI

For the purposes of dispositioning, monitoring, and troubleshooting an image through the TFH, SRTA requires an Image Search functionality that allows authorized users to search for, view and select specific images. The Image Search GUI requirements are as follows:

No.	Transaction/Image Search GUI Requirement
	The IPS shall provide an image search GUI that allows authorized users to search for and view transactions and associated images.
	The Image Search GUI shall have configurable search tools to locate images by image and Transaction data.
	The Image Search GUI shall display search results as images (as in a gallery), data, or both, based on user selections.
	Images displayed as thumbnails or at reduced size shall be clickable to display the full image.
	The Image Search GUI shall allow authorized users to export search results in PDF, CSV, and Excel formats.
	The Image Search GUI shall allow authorized users to select individual images or subsets of the image search results for export.
	Search criteria in the Image Search GUI shall include, but not be limited to: <ol style="list-style-type: none"> <li>1. Datetime range.</li> <li>2. Facility(s).</li> <li>3. Toll Point(s).</li> </ol>

No.	Transaction/Image Search GUI Requirement
	<ol style="list-style-type: none"> <li>4. Lane(s).</li> <li>5. Transponder ID.</li> <li>6. Transponder Agency.</li> <li>7. LPN.</li> <li>8. LPJ.</li> <li>9. LPT.</li> <li>10. Camera ID.</li> <li>11. Front or Rear Image.</li> <li>12. Classification.</li> <li>13. Transaction ID.</li> <li>14. ALPR Confidence or range.</li> <li>15. Trip ID (if available).</li> <li>16. Transaction status: <ol style="list-style-type: none"> <li>a. Waiting for image review result.</li> <li>b. Final plate assigned.</li> <li>c. Coded-Off(s) (with reason).</li> <li>d. Exception(s) (with description).</li> <li>e. Other status as discussed during design phase as needed.</li> </ol> </li> <li>17. Any other criteria developed during the design phase.</li> </ol>
	<p>The Image Search GUI shall display the following fields:</p> <ol style="list-style-type: none"> <li>1. Datetime of Transaction.</li> <li>2. Datetime of Final LPN Result (if available).</li> <li>3. Facility.</li> <li>4. Direction.</li> <li>5. Toll Point.</li> <li>6. Lane.</li> <li>7. Camera ID.</li> <li>8. Transaction ID.</li> <li>9. Trip ID (If available).</li> <li>10. Transponder ID.</li> <li>11. Transponder Agency.</li> <li>12. Final LPN.</li> <li>13. Final LPJ.</li> <li>14. Final LPT.</li> <li>15. Transaction Status (related to Image Processing System): <ol style="list-style-type: none"> <li>a. Waiting for Result.</li> <li>b. Final Plate Assigned.</li> <li>c. Coded-Off (with reason).</li> <li>d. Exception (with description).</li> <li>e. Other status as discussed during design phase as needed.</li> </ol> </li> </ol>

No.	Transaction/Image Search GUI Requirement
	16. Thumbnail of Images associated with the transaction.

#### 2.2.5.6 Congestion Pricing System

SRTA currently manages its Express Lane (EL) facilities using congestion pricing. For maximum flexibility to meet various demands, SRTA requires the TISC to provide a Congestion Pricing System (CPS) that can dynamically calculate toll rates based on traffic conditions and/or use a time-of-day pricing approach to set rates based on datetime. The CPS is also required to control each TRDMS, posting all rates and messages to each TRDMS accurately.

SRTA divides each EL facility in each direction into Pricing Segments. Pricing Segments are virtual but are, in general, aligned with entry and exit points along the EL in a direction. The CPS shall assign/generate a rate per mile toll rate to a Pricing Segment for a time interval. The Pricing Segment toll rates will then be combined to form OD pair toll rates such that Trips are assigned the OD pair rate that was in effect at the respective entry times of the Trips.

The General CPS requirements are as follows:

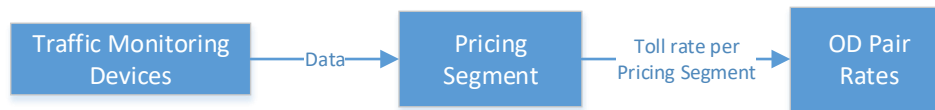
No.	General CPS Requirements
	The CPS shall be configured such that any parameters and configurations set for a given Facility and direction are independent of each other. For example, I-85A SB CPS settings must be independent of I-85A NB CPS settings.
	All system changes and all schedule rate plans shall go into effect (including posting the rate to the TRDMS) at the start of the next pricing interval following the manual or scheduled change.
	The CPS shall meet all related business rules for the management of Toll Rates, as shall be described in the Business Requirements Document, to be created during the design process according to Section: 4.6.4.1 Business Requirements Document (BRD).

##### 2.2.5.6.1 Roadway and System Parameter Configuration

Roadway and System Parameter configurations are used to configure each facility and direction to address the following questions such that the CPS calculates rates and assigns toll rates to respective OD pairs:

1. Which traffic monitoring devices (MDS, TP, etc.) are configured in a Pricing Segment?
2. What are the properties of the Pricing Segment (e.g., segment length)?
3. Which Pricing Segments make up an OD pair?
4. Which OD pairs are configured to which TRDMS inserts/panels?
5. What constraints would be applied to rate plans?

The Roadway and System parameter configurations are also intended to allow SRTA to set operational parameters.



The Roadway and System Parameter requirements are as follows:

No.	Roadway and System Parameter Requirements
	The CPS shall allow authorized users to view/modify the configurations for how anomalous traffic monitoring sensor data is detected and handled for use in the CPS. (e.g. displaying and detecting traffic sensors producing out-of-range data, ability to include/exclude specific traffic sensors from pricing calculations, displaying traffic sensor to pricing segment configuration).
	The CPS shall provide the functionality to use tolling point transaction data as a traffic data source (equivalent to a traffic monitoring device) for the pricing algorithms.
	The CPS shall allow authorized users to view/modify the configuration of how tolling points are assigned as traffic sensors to pricing segments within the CPS and assigned to OD pairs for trip building.
	The CPS shall allow authorized users to view/modify the configuration of pricing segments.
	The CPS shall allow authorized users to view/modify the configuration of OD pairs.
	The CPS shall allow authorized users to configure all CPS global system parameters.
	The CPS shall allow authorized users to assign which traffic monitoring devices will be used for calculation of traffic data to the CPS.
	The CPS shall allow authorized users to assign one or multiple traffic sensors and corresponding GP and EL lanes to each Pricing Segment and set a weighting for how each is used in the pricing calculation.
	Pricing segments must be assigned at least one traffic sensor.
	One traffic sensor shall have the ability to be assigned to multiple Pricing Segments.
	The CPS shall allow users to configure default speed and volume values for the CPA to use in the event no vehicles are detected or if speed and volume values exceed configurable thresholds.
	The CPS shall allow authorized users to assign a segment length to the nearest 10 <sup>th</sup> of a mile for each Pricing Segment.
	The CPS shall allow authorized users to assign one or multiple pricing segments to each OD pair. One pricing segment may be assigned to multiple OD pairs.
	Each OD pair shall be assigned at least one Pricing Segment.
	The CPS shall allow authorized users to assign an OD pair length to the nearest 10 <sup>th</sup> of a mile for each OD pair.
	All TRDMS shall be mapped to their applicable OD pair(s).
	The mapping of TRDMS to respective OD pair(s) shall be configurable such that the TISC can modify the mapping when requested by SRTA.
	The CPS shall allow authorized users to configure the following system parameters for each EL facility:

No.	Roadway and System Parameter Requirements
	<ol style="list-style-type: none"> <li>1. <b>CPA Toll Rate Interval</b> - Frequency at which rates are calculated and posted to the TRDMS. A separate parameter would apply for each toll facility pair. Applies to Congestion Pricing Algorithm (CPA).</li> <li>2. <b>Max Throughput Value(s)</b> - Traffic value(s) for any or all Pricing Segment(s) that result in the maximum throughput of vehicles (e.g., 1600 vehicles per hour per lane, 25 vehicles per mile, 55 miles per hour); this value may vary by segment. Applies to CPA.</li> <li>3. <b>Max Toll Rate Increase</b> - For any or all OD pair rate(s), sets the maximum rate increase per toll rate interval. Applies to the CPA.</li> <li>4. <b>Max Toll Rate Decrease</b> - For any or all OD pair rate(s), sets the maximum rate decrease per toll rate interval. Applies to CPA.</li> <li>5. <b>Min (\$0.00) and Max (\$999.99) Toll Rate per OD pair</b> – Ability to configure a min and max toll rate for each OD pair for each facility. The calculated toll rate shall not exceed the configured values for each OD pair.</li> <li>6. <b>Advance Scheduling Maximum</b> - Maximum number of days a rate plan can be scheduled in advance.</li> <li>7. <b>Toll Rate Rounding</b> - Rounds the toll rates calculated for all OD pairs to the configured decimal value (e.g., \$0.01, \$0.05, \$0.10).</li> <li>8. <b>Holiday</b> - Ability to configure dates up to a year in advance from the current date that are considered holidays for the purposes of scheduling “holiday” rate plans.</li> </ol>
	All changes to the CPS roadway and system parameter configuration shall be logged including identifying the user who implemented the changes, the datetime of the changes and what the changes were.
	All CPS roadway and system parameter configuration changes shall be viewable in a CPS GUI.
	All CPS roadway and system parameter configuration changes shall be viewable in reports.
	All CPS roadway and system parameter records for configuration changes shall be recorded in the database.

#### 2.2.5.6.2 Interface to the TRDMS

The requirements for the interface to the TRDMS are as follows:

No.	TRDMS Interface Requirements
	The CPS shall communicate with all TRDMSs for the accurate display of current rate data, and/or Alphanumeric Manual Override messages.
	The CPS shall communicate new messages to signs within ten seconds of the message being created, whether by override or CPS calculation.
	The CPS shall poll the TRDMS at configurable intervals to retrieve and store the message displayed on the TRDMS.
	The CPS shall provide a GUI with search or filter tools for reviewing displayed sign messages.
	Any failure or disruption in communication between the CPS and the TRDMSs shall be reported to MOMS.

### 2.2.5.6.3 Rate Plans

A Rate Plan identifies what rate should be used based on the time of day for Pricing Segments. Each timeslot in the rate plan is assigned a static dollar per mile rate or a reference to the CPA algorithm that should be used to calculate the rate at that time for that Pricing Segment. A rate table can then be allocated to specific days and will describe how the rate should be calculated for each pricing segment throughout the day on those specific days. In other words, a Rate Plan is a timetable of rates that defines what rate strategy is to be used for Pricing Segments. Figure 11: Rate Plan components shows the components of a Rate Plan.

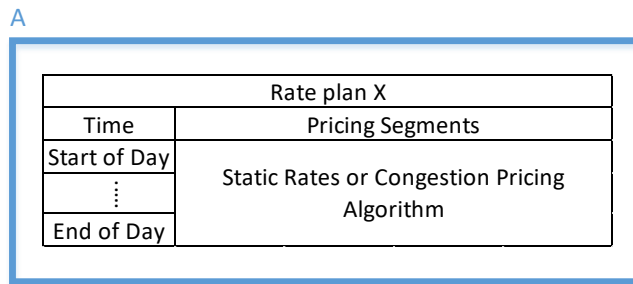


Figure 11: Rate Plan components

Rate plan 1				
Time	PS1	PS2	....	PS7
0:00	Static1	CPA2	....	Static2
5:00	CPA1	CPA1	....	Static3
12:00	Static2	Static1	....	
15:00		static2	....	Static1

B
C
D
E

Figure 12: SRTA definition of a Rate Plan

Figure 12: SRTA definition of a Rate Plan shows an example of how SRTA defines a Rate Plan. The box outlined in B lists the different start times for the various configured rate plans (Figure 12: SRTA definition of a Rate Plan – C). The two different rate types shown are CPA (Figure 12: SRTA definition of a Rate Plan – E) and static rates (Figure 12: SRTA definition of a Rate Plan – D). Static rates are a dollar per mile toll rate that will be in effect for a pricing segment.

As indicated by Figure 12: SRTA definition of a Rate Plan – C, the Rate Plan can consist of a static rate or a CPA for a Pricing Segment at different times. The individual dollar per mile toll rate per Pricing Segment then would be aggregated to an OD pair rate to assign the correct rate to the resulting Trips. For example, CPA may exist for morning peak conditions, with a different CPA for afternoon/evening conditions, and a static rate for the overnight conditions.

It is not required that rate plans function exactly as described above in this section summary, however, at a minimum, the system should allow a rate plan to be scheduled, which includes all pricing segments in a facility for a twenty-four (24) hour period, using a combination of static rates and congestion pricing rates.

The requirements for Rate Plans are as follows:

No.	Rate Plan Requirements
	The CPS shall allow users to create rate plans for a specific Facility and direction.
	The CPS shall allow users to end rate plans for any Facility and direction.
	The CPS shall allow users to schedule rate plans up to the Advance Scheduling Maximum setting.
	The CPS shall allow users to make near real-time updates and/or scheduled rate plan changes for all Pricing Segments for any Facility and direction.
	Static rates shall be entered in rate per mile format.
	Rate plans shall have a unique name of up to 128 alphanumeric characters in length.
	Rate plans shall have a rate plan type of up to 128 alphanumeric characters in length.
	Rate plans created shall require rates to be set for a full 24-hour period for each Pricing Segment belonging to the Facility and direction covered by that rate plan.
	When creating or editing a rate plan, the CPS shall allow authorized users to set a per mile static toll rate or allocate a CPA algorithm for increments of time in a 24-hour period for one or more of the Pricing Segments associated with that rate plan.
	When creating or editing a rate plan, the CPS shall allow users to allocate a CPA algorithm for all or a portion of a 24-hour period for one or more Pricing Segments.
	After modification or creation of a rate plan, the CPS shall provide a function for the rate plan to be submitted and shall be marked as draft until another user, based on authorization, has approved the rate plan.
	The CPS shall provide a function to allow authorized users to approve draft rate plans.
	The CPS shall allow authorized users to import a rate plan using a CSV or similar file format. A mockup of a potential layout of a rate plan is in Appendix I: Sample Rate Plans.
	The imported file shall allow input of toll rates in rate per mile, Pricing Segments, and time intervals within a single table.
	The CPS shall allow users to use past rate plans as templates for the creation of a new rate plan.
	The CPS shall allow authorized users to export uploaded Static rate tables to a CSV or similar file. A mockup of a potential layout of a rate plan is in Appendix I: Sample Rate Plans.
	The CPS shall display an error message with the cause of the error if the CPS fails to accept the imported rate plan or a rate plan submitted using the GUI.
	The TISC shall discuss, review, and receive SRTA approval for error messages generated by the CPS when users import rate plans.
	The CPS shall allow users to export rate plans to a CSV or similar file.
	The CPS shall allow users to create dynamic rate plans manually via the GUI.
	The CPS shall display all created rate plans in a table for users to view, and search and sort by: <ol style="list-style-type: none"> <li>1. Facility.</li> <li>2. Direction.</li> <li>3. Rate Plan Name.</li> <li>4. Creation Datetime.</li> </ol>



No.	Rate Plan Requirements
	5. Rate Plan Creator.
	The CPS shall allow authorized users to archive old rate plans not in use so that they are hidden from a user's view.
	The CPS shall enable users to toggle the display of archived rate plans in the rate plan table.
	For reversible facilities, rates plans shall remain in effect and calculate rates at all times in both directions regardless of roadway direction, transition, or closure.

#### 2.2.5.6.3.1 Time of Day Pricing Algorithm

The CPS shall calculate toll rates using the Time-of-Day pricing algorithm for the OD pairs with Pricing Segments that are identified as having a static price for the current time of day.

The requirements for the Time-of-Day Pricing Algorithm are as follows:

No	Time of Day Pricing Algorithm Requirements
	The CPS shall automatically calculate the OD pair toll rates, the corresponding pricing segments and the corresponding per mile rate from the active rate plan for that time of day.
	<p>The CPS shall calculate OD pair rates by summing each corresponding Pricing Segments' per mile rates multiplied by each Pricing Segments' distance.</p> $\sum_{\text{pricing Segment in OD pair}} \text{Pricing Segment distance} \times \text{per mile toll rate} = \text{OD Pair Rate}$
	The toll rates calculated for each OD pair that exceed the configured Max Toll Rate value shall be posted as the Max Toll Rate value.
	The toll rates calculated for each OD pair that fall below the configured Min Toll Rate value shall be posted as the Min Toll Rate value.

#### 2.2.5.6.3.2 Congestion Pricing Algorithm

Congestion Pricing Algorithm (CPA) is an algorithm that automatically calculates dollar per mile toll rates based on congestion measurements. The CPA should calculate higher toll rates when the Facility is congested and lower toll rates when the Facility is less congested.

The CPA allows users to adjust the following algorithm parameters:

1. Rate of increase of the toll rate relative to congestion.
2. Rate of decrease of the toll rate relative to congestion.
3. Increase and decrease of toll rates relative to varying congestion levels.

The requirements for Congestion Pricing Algorithm are as follows:

No.	Congestion Pricing Algorithm Requirements
	The Congestion Pricing Algorithm (CPA) shall obtain and utilize near real-time raw traffic data, including speed and volume data, from the configured traffic sensors and devices deployed as part of the ETCS.
	<p>The CPA shall process the data to calculate the new toll rate for each configured Pricing Segment, and corresponding OD pair based on the traffic data and selected CPA configuration such as:</p> <ul style="list-style-type: none"> <li>6. Current and prior traffic data for a Pricing Segment.</li> <li>7. Length of Pricing Segments.</li> <li>8. Pricing Segments configured into OD pairs.</li> </ul>
	The CPS shall calculate toll rates at every CPA Toll Rate Interval during the configured time slot in the active Rate Plan.
	The calculated toll rates or a toll rate per mile for each pricing segment shall increase or decrease based on the current and previous traffic conditions with the goal to maintain the configured Max Throughput value(s).
	When increase or decrease in rate exceeds the configured Max Toll Rate Increase/Decrease values, the rate shall change by the Max Toll Rate Increase or Decrease value, as applicable.
	Changes made to configurable parameters in the CPA shall take effect in time for the next calculation to be made.
	The CPS shall allow creation, editing and saving of named sets of CPA parameters that can be entered in Rate Plans.
	The CPA shall use the configured weighting factors for traffic measurement values from the EL or General Purpose (GP) Lanes (e.g., to give more emphasis on traffic conditions from the EL than the GP Lanes).
	The CPA shall include configurable parameters that will allow authorized users to modify the rate at which a toll rate will increase in response to congestion measurements.
	The CPA shall include configurable parameters that will allow authorized users to modify the rate at which a toll rate will decrease in response to congestion measurements.
	The CPA shall include configurable parameters that will allow authorized users to adjust the relative max/min congestion measurements (specifically LOS) that the CPA works between.
	To ensure that only accurate traffic data is used in its calculations, the CPA shall disregard data outside of the configured threshold for a data source.
	The CPS shall detect insufficient data from Traffic Sensors used by the Congestion Pricing Algorithm and notify MOMS.

#### 2.2.5.6.3.3 Failover Pricing

SRTA requires a CPS that displays an accurate toll rate on the TRDMS at all times. In the event there are failures or interruptions to calculating toll rates, CPS should use the failover rate plans for impacted Pricing Segment(s). The Failover Rate Plans will consist of static rates automatically generated by the system based on the historical rate for each facility, direction, given day of the week. For example, every 2 months

the CPS would generate a failover rate plan that is the average of all rates in 15-minute increments for each day of the week from the past month.

The requirements for Failover Pricing are as follows:

No.	Failover Pricing Requirements
	The CPS shall automatically detect and notify users when the system is unable to calculate or post toll rates to the TRDMS regardless of the cause.
	When the CPS is unable to calculate toll rates, the CPS shall implement the failover rate plan for the current day of the week.
	In the event the CPS receives less than the minimum sensor data required for the CPA to calculate a toll rate, the CPS shall implement a failover rate plan for that Pricing Segment.
	If no rate plan has been scheduled for the current time or location, the CPS shall automatically implement the failover rate plan.
	The Failover rate plans shall be automatically generated from historical rate data.
	The Failover rate plan calculations shall have the following configurable parameters: <ol style="list-style-type: none"> <li>1. Failover rate plan time increment (generally minutes).</li> <li>2. Failover rate plan look back time (generally months).</li> <li>3. Failover rate plan update frequency (generally weeks).</li> </ol>
	The failover rate plan time increment shall configure the time interval to which the failover rate is assigned.
	The failover rate plan look-back time shall configure how far the CPS looks back to calculate the failover rate for a given weekday.
	The failover rate plan update frequency shall configure how often the CPS refreshes the failover rates.
	A failover rate plan shall be generated for each day of the week by Facility, direction, and Pricing Segment.
	The CPS shall have a default failover rate plan that will be used when the system fails to calculate a historical rate.
	In the event that the system does not have any historical data to calculate a historical rate (e.g., at the time of TFH Go-live), the TISC shall coordinate with SRTA to have a default failover rate in place to initialize the system.
	The CPS shall automatically start calculating historical rates as soon as the CPS has sufficient historical data.

#### 2.2.5.6.4 Schedules

Rate plans will be scheduled by SRTA for days of the week for a set duration of time or indefinitely. Certain rate plans may be applied during set holidays.

The requirements for the Rate Plan scheduling:

No.	Rate Plan Scheduling Requirements
	The CPS shall allow authorized users to schedule rate plans for day(s) of the week for a set duration of time. For example, users would be allowed to schedule “Rate Plan 1” for Tuesday, Wednesdays, and Thursdays from 2/13/2023 through 4/26/2023.
	The CPS shall allow authorized users to schedule rate plans to go into effect up to a configurable maximum number of days in advance.
	The CPS shall allow users to schedule rate plans without an end date.
	The CPS shall require users to press a button to confirm before scheduling a rate plan.
	The CPS shall confirm all required fields are completed prior to scheduling rate plans.
	The CPS shall allow users to cancel scheduling a rate plan.
	The CPS shall display all scheduled rate plans in a Sc for users to view.
	The CPS shall allow authorized users to search and sort scheduled rate plans by: <ol style="list-style-type: none"> <li>1. Facility.</li> <li>2. Direction.</li> <li>3. Schedule Name.</li> <li>4. Creation Datetime.</li> <li>5. Schedule Start Datetime.</li> <li>6. Schedule Creator.</li> </ol>
	The CPS shall allow users to archive old scheduled rate plans not in use so that they are hidden from a user’s view.
	The CPS shall enable users to toggle the display of archived schedules in the scheduled rate plan table.
	The CPS shall allow users to edit the end date of a scheduled rate plan to extend or shorten the duration of the schedule.
	The CPS shall begin determining toll rates of scheduled rate plans when their effective start time is reached.
	The CPS shall allow users to use past schedules as templates for the creation of a new schedule.
	If a scheduled rate plan’s effective start time overlaps with a scheduled rate plan that is currently in effect or previously created scheduled rate plan with an effective date in the future, the effective start time of the most recently scheduled rate plan shall take precedence.
	The CPS shall allow authorized users to configure the holidays on a yearly basis from the current date.
	Schedules shall be approved by a CPS supervisor or administrator prior to being activated.
	The CPS shall allow CPS supervisors or administrators to approve schedules in advance.
	The CPS shall allow authorized users to view, in a scrollable calendar, scheduled rate plans, including standard and retroactive manual overrides, for one or more pricing segments per Facility and direction.

#### 2.2.5.6.5 Manual Overrides

To accommodate events in the EL outside of normal traffic, SRTA may use manual overrides to adjust the toll rates. The types of manual overrides that SRTA anticipates are as follows:

1. **Standard Manual Override:** A combination of per mile rates and corresponding pricing segments that can be scheduled to override a current or scheduled rate plan, with a current or future start and a future end datetime. A Standard Manual Override can be manually expired at any time during its implementation. When a Standard Manual Override become active, it impacts the rates sent to the sign and the rates that will be allocated to trips that occur while active.
2. **Retroactive Manual Override:** A set of time slots and total trip prices by OD pair that can be scheduled with a start and end datetime in the past. This type of override will be used to assign corrected rates to Trips after an incident (e.g. a network outage or sign outage where the CPS rate and sign rate differed). An example rate plan import table is included in Appendix I: Sample Rate Plans as “Appendix – Sample CPS Retroactive Override\_import.xlsx”.
3. **Alphanumeric Manual Override:** A type of standard manual override associated with the publishing of an alphanumeric message to a rate sign. An Alphanumeric Manual Override will not impact the application of rates to Trips from the underlying rate plan currently in effect; it will be only an override to display a message on the TRDMS. To address the rate charged while an Alphanumeric Manual Override is in effect, SRTA could implement either a retroactive override to cover that period of time or implement a standard manual override in concert with the Alphanumeric Manual Override if a rate different to that calculated by the CPS is to be charged. Alphanumeric Manual Override functionalities are detailed in 2.2.5.18 Toll Operation Center System (TOCS).

Because override functionality is expected to be used mostly during incidents, SRTA requires an intuitive system that allows Operators and other authorized users to implement overrides efficiently.

The general requirements for Manual Overrides are as follows:

No.	General Manual Override Requirements
	The CPS shall provide the capability for an authorized user to execute a Standard Manual Override.
	The CPS shall provide the capability for an authorized user to execute a Retroactive Manual Override.
	The CPS shall provide the capability for an authorized user to execute an Alphanumeric Manual Override.
	The CPS shall provide the capability for an authorized user to manually override the current displayed rate by scheduling a Standard Manual Override rate plan for one or multiple pricing segments.
	The Standard Manual Override shall take precedence over any current or scheduled rate plan entry for the overridden Pricing Segments until the override ends.
	For Standard Manual Overrides, only the pricing segments contained in the Manual Override rate plan shall be overridden.
	The CPS shall provide the capability for an authorized user to apply a Retroactive Manual Override to one or more OD pairs.

No.	General Manual Override Requirements
	For Retroactive Manual Overrides, only the selected pricing segments and/or OD pairs shall be overridden.
	During the Design Phase, the TISC shall coordinate with SRTA to review and approve how and when overrides apply to a Pricing Segment.
	The CPS shall provide an Emergency Override user interface to allow authorized users to rapidly override the current and scheduled rates for all OD pairs for all or select facilities and directions with one toll rate, or toll rates for individual OD pairs in near real-time.
	The CPS shall allow authorized users to enter a start and end datetime for all overrides.
	For all overrides, both the original and changed toll rate shall be recorded along with the user ID, reason for the override, and datetime of the override.
	For all Standard Manual Overrides, the end datetime shall remain blank if the end datetime is unknown at the time of activation.
	Users shall have the ability to cancel one or all active overrides in near real-time.

#### 2.2.5.6.5.1 Retroactive Manual Override

The specific requirements for Retroactive Manual Overrides are as follows:

No.	Retroactive Manual Override Requirements
	Retroactive Manual Overrides shall activate a static rate plan by OD pair.
	Retroactive Manual Overrides shall require an authorized user to enter start and end datetimes in the past.
	The CPS shall allow authorized users to retroactively adjust rates in accordance with SRTA policy and procedures (e.g., EL traffic incident, state of emergency, sign failure).
	Retroactive Manual Override adjusted toll rates shall be applied automatically to Trips customers made during the override's effective time.
	The Retroactive Override shall set toll rates for all non-posted Trips for the OD pair and time period specified by the override criteria.
	Retroactive overrides shall be possible for up to twelve (12) hours in the past.

#### 2.2.5.6.6 Parallel CPS Test Environment

The purpose of the Parallel CPS Test Environment is for SRTA staff to utilize, familiarize, analyze, develop, and compare system parameters, roadway configuration, rate plans, and schedules in preparation for and during operation of each facility.

The requirements of the Parallel CPS Test Environment are as follows:

No.	Requirement
	The CPS shall enable users to access a fully configurable Parallel CPS Test Environment, which shall include all dashboard and reports functionality required for the production CPS that can

No.	Requirement
	be used to change and review configurations and review the rates calculated by the parallel system.
	The Parallel CPS Test Environment shall be available to SRTA at least 60 days prior to the start of the first TFH Revenue Ready Test.
	The Parallel CPS Test Environment shall be a replicated version of the production CPS, i.e., the Parallel CPS Test Environment cannot be a degraded version of production CPS.
	The parallel CPS shall access real-time traffic sensor data and shall calculate rates according to the parallel CPS configuration.
	If both a live and Parallel CPS Test Environment are configured with the same Facility, system parameters, roadway configuration, rate plans, and schedules, both the live and Parallel CPS Test Environment shall produce the same toll rates.
	At least 60 days prior to the start of the TFH Revenue Ready Test for the second legacy TSI toll facility pair, the TISC shall update the Parallel CPS Test Environment with the most current fully tested version of the release candidate for the updated TFH.
	The Parallel CPS Test Environment shall allow SRTA to fully configure CPS test facilities, including all system parameters and roadway configurations, using data from roadway components (real-time traffic sensors) deployed as part of the ETCS from each project.
	The Parallel CPS Test Environment shall allow SRTA to develop and implement rate plans and schedules to the CPS test facility alongside other facilities in operation.

#### 2.2.5.7 Trip Building System

The TFH is to include a Trip building system that builds and transmits rated Trips to the CBO for account posting and violation processing. SRTA has a set of business rules, that the Trip building system must follow.

Currently there are two types of tolled facilities operated by SRTA; Entry Exit and Gantry-controlled facilities. There are a set of requirements to be met for both facility types as well as requirements unique to each facility type. These requirements are defined in the tables below.

##### 2.2.5.7.1 All Trips for All Facility Types

For all facility types, at a minimum, the Trip Building System requirements are as follows:

No.	General Trip Building System Requirements
	The TFH shall include a Trip Building System that collects Transaction data to build a rated Trip that accurately tracks travelers' progress through the EL Corridors.
	The Trip Building System shall build Trips based on the Transactions transmitted from the zone controllers for all EL Facilities.
	The Trip Building System shall support SRTA's Business Rules.
	Each Trip formed by the TFH shall be assigned a unique identifier.
	The Trip Building System shall not modify or overwrite any Transactional data.

No.	General Trip Building System Requirements
	At least one vehicle identifier, transponder or LPN, on Transactions sent to the CBO shall be from a physical detection from the roadside.
	The Trip Building System shall designate a primary image from among the images provided for each Trip posted to the CBO according to the logic defined in Attachment 10: STI ICD.
	Trips built by the Trip Building System shall consist of one or many Transactions.
	The Trip Building System shall build Trips from Transactions grouped by facility and direction so that no single Trip will include Transactions from more than one facility or direction.
	The Trip Building System shall utilize vehicle Transaction data such as transponder number or license plate number, or a combination of transponder and plate data to build Trips.
	All Trips shall be assigned an OD pair as configured by the appropriate Roadway Configuration parameters.
	The time ranges used to identify Transactions for Trip building shall account for a vehicle's average travel time plus a configurable time allowance in order to capture all possible Transactions created within a Trip.
	The Trip Building System shall minimize the time between when Transactions are received by the Trip Building System and the time Transactions are combined to form a trip in a status that is ready to be posted to CBO.
	The Trip Building System shall not build a trip until all potential associated transactions for that trip are processed and available to the Trip Building System. This includes completion of the image review process for transactions that require image review.
	The details and logic that define a Trip status that is ready to post to the CBO shall be determined during the Design Phase.
	<p>A rate shall be assigned for each Trip based on the toll rate in effect according to the TFH, at the time the vehicle entered an EL Facility. The assigned toll rate shall be determined by:</p> <ol style="list-style-type: none"> <li>1. AVI reads from the TRDMS Travel Time Sites (where available) to determine the posted rate the customer saw before they entered the EL; or</li> <li>2. Calculation of estimated travel time between the TRDMS and when a vehicle entered the EL based on the logical sequence of Transaction data of location, time, duration of time between the sign and the entry, and average speed as well as a time threshold to assign the lowest rate that the customer could reasonably have seen.</li> </ol>
	For Transactions where tag-to-plate correlation information in TVLs is used for transaction matching, the system shall clearly identify these Transactions and the data that is provided from the TVL.
	<p>Trips shall be labeled as one of the following Trip Types:</p> <ol style="list-style-type: none"> <li>1. <b>AVI Trip</b> - All Transactions in the Trip include AVI reads and license plate.</li> <li>2. <b>AVI Only Trip</b> - All Transactions in the Trip include only AVI reads (no license plate).</li> <li>3. <b>Plate Based Trip</b> - All Transactions in the Trip only have license plate data (no AVI reads).</li> <li>4. <b>Mixed (AVI and Plate) Trip</b> - Trip formed by combination of Transactions with an AVI read and/or license plate associated with the transponder read by the AVI.</li> <li>5. <b>Pattern Trip</b> - Trip formed with one entry or exit Transaction and one "pattern" Transaction. A Pattern Transaction is one that the system applied a logic to assume where</li> </ol>



No.	General Trip Building System Requirements
	<p>the vehicle entered or exited based on previous vehicle travel history. [Entry-Exit Facility only].</p> <p>6. <b>Assumed Entry Trip</b> - Trip formed with one exit Transaction and one manufactured entry Transaction. [Entry-Exit Facility only].</p> <p>7. <b>Assumed Exit Trip</b> - Trip formed with one entry Transaction and one manufactured exit Transaction. [Entry-Exit Facility only].</p> <p>8. <b>Other Trip Type</b> - Additional Trip types may be defined during the Design Phase of the Project(s).</p>
	The Trip Building System shall automatically assign all Trips with a confidence level or threshold value.
	Confidence levels and threshold values shall be calculated based on Trip types, plate and/or transponder matching, OCR/image review confidence, and the composition of the Transactions within a Trip.
	Transactions that are received after their associated Trip is built, but has not posted to the CBO, shall be appended to the Trip.
	Transactions that are received after their associated Trip is posted to the CBO shall be exceptioned and reported on, including the Trip ID that a Transaction would have been appended to if such Trip was available.
	The Trip Building System shall allow authorized SRTA users the ability to configure a confidence level threshold value such that only Trips whose confidence level values are greater than or equal to the specified value are allowed to post to the CBO automatically. (e.g. if set confidence value threshold is 90, Trips with confidence value of 90 or higher can post automatically to the CBO.)
	The Trip Building System shall apply exception processing rules and functionalities to Transactions that are unable to be formed into a Trip, such as an “orphaned” entry Transaction with no associated exit Transaction.
	The Trip Building System shall allow SRTA to disposition Orphaned Transactions such that a Trip can be built and sent to SRTA’s CBO.
	The Trip Building System shall include a SRTA configurable dwell or hold time wherein Trips are not sent to SRTA’s CBO until this dwell or hold time has elapsed.
	Before a Trip is posted to the CBO, the Trip Building System shall allow authorized users to merge two or more Trips into a single Trip.
	The Trip merge capability shall prevent users from incorrectly merging Trips (e.g., merging Trips in different directions, merging Trips from two different facilities, etc.).
	Before a Trip is posted to the CBO, the Trip Building System shall allow authorized users to split one Trip into two or more Trips.
	The Trip Building Process shall include built-in logic to ensure that new Trips created by splitting or merging Trips are automatically rated correctly.
	Before a Trip is posted to the CBO, the Trip Building System shall allow authorized SRTA users to perform additional modifications identified during the Design Phase of the Project(s).

No.	General Trip Building System Requirements
	The Trip Building System shall provide functionality to reprocess Trips from a selected time frame and facility/direction before they are posted to the CBO by disassembling the selected Trips into Transaction Records and resending them through the Trip Building Process to be formed into new Trips in accordance with the applicable Trip building logic.
	The Trip Building System shall keep a record of the rebuilt Trips such that SRTA can run a report to disposition those Trips.
	The Trip Building System shall accommodate the two tolling facility types; Entry-Exit and Gantry-controlled facilities.
	<p>At each step in the Trip Building processing, the Trip Building System shall assign each Trip with one (and only one) of the following statuses:</p> <ol style="list-style-type: none"> <li>1. The individual Trip is being held in the system per requirements in Section 2.2.5.72.2.5.7: Trip Building System (Trip Mandatory Hold).</li> <li>2. The individual Trip requires a human to examine and post the Trip to the CBO based on the calculated Trip confidence level (Trip Waiting for Human Review).</li> <li>3. Trip was sent to the CBO (Trip Posted).</li> <li>4. Trip was sent to the CBO and the CBO acknowledged that the Trip was received and posted (Trip Reconciled Successfully).</li> <li>5. Trip was sent to the CBO but failed to post. CBO will provide a failure code as defined in STI ICD (Trip Failed to Post).</li> <li>6. Trip was written off manually (Trip Written Off): <ol style="list-style-type: none"> <li>a. Trips written off must be associated with a reason for why it was written off.</li> </ol> </li> <li>7. Trip was archived because it was merged into a new Trip (Merged Trip): <ol style="list-style-type: none"> <li>a. Trips merged must be associated with a reason for why it was merged.</li> </ol> </li> <li>8. Original Trip that was split into two or more different Trips (Split Trip): <ol style="list-style-type: none"> <li>a. Trips split must be associated with a reason for why it was split.</li> </ol> </li> <li>9. Additional statuses identified during the Design Phase of the Project(s) (Other).</li> </ol>
	The Trip Building Process shall alert a configurable set of users when Trips remain unposted to SRTA's CBO for a configurable period.
	Trips and associated Transactions shall be sent to SRTA's CBO in accordance with the Standard Transaction Interface (STI) described in Section 2.2.5.12: Interfaces.
	Each Trip sent to the CBO shall make all required images available for CBO retrieval, as defined in the images section of Appendix 10: STI ICD.

#### 2.2.5.7.1.1 Entry Exit Facility

Entry Exit facilities are those where Trips consist of a single entry and a single exit Transaction. I-75A and I-75B are Entry Exit Facilities. The Trip Building requirements unique to Entry Exit toll facilities are as follows:

No.	Entry and Exit Facility Type Trip Building Requirements
	The Trip Building System shall build Trips consisting of an entry and an exit Transaction matched to a unique vehicle.

No.	Entry and Exit Facility Type Trip Building Requirements
	The Trip Building System shall disposition Orphaned Transactions into Trips.
	The Trip Building Process shall have logic to build Pattern Trips to match an Orphaned Transaction using probability based on prior trips for that user.
	The methodology for building a pattern-based trip shall be determined during the design phase and approved by SRTA.
	The Trip Building Process shall have logic to build Assumed Entry Trips when the Trip processing cannot find a valid matching Entry Transactions for an existing Exit Transaction for a vehicle.
	For an Assumed Entry Trip, the Trip Building System shall use the AVI read from a TRDMS, if available and as specified in the approved Entry Exit Trip building criteria, to assume the entry location for Trips where no valid entry Transaction is found (i.e. manufactured entry Transaction).
	The Trip Building Process shall have logic to build an Assumed Exit Trip when Trip processing cannot find valid Exit Transactions for a vehicle found (i.e. manufactured exit Transaction).

#### 2.2.5.7.1.2 Gantry-Controlled Access Facility

Gantry-Controlled Access facilities have multiple tolling gantries in a tolling segment. A vehicle must be detected at a minimum number of toll points within a tolling segment for the tolling segment to be included in an OD pair. In most cases, tolling segments align with Pricing Segments as configured in the CPS. Each facility has multiple tolling segments per direction. Examples of this type of Facility are I-85 EL and I-85 EL Extension. The Trip Building requirements for Gantry-controlled Access toll facilities are as follows:

No.	Gantry Controlled Access Facility Type Trip Building Requirements
	The Trip Building System shall build Trips when a vehicle is detected (either by Transponder ID or LPN) at a configurable minimum number of EL gantries within a tolling segment.
	For Gantry-Controlled Access Facility, a Trip shall consist of one or more pricing segments.
	The Trip Building System shall determine if a vehicle crossed a Double White Line (DWL) separator.
	The threshold for flagging a DWL Trip shall be based on the number of missed gantry transactions in the Trip. Authorized SRTA users shall have the ability to configure this threshold by Facility, direction, and segment.
	The Trip Building System shall allow authorized SRTA users to enable or disable an option for Trips flagged for crossing a DWL separator to be automatically submitted for human review prior to posting them to the CBO.
	DWL processing shall have the ability to be switched on or off by Facility, pricing segment and direction.
	The Trip Building System shall build a single Trip when a vehicle enters the EL in one segment, has no Transactions in a downstream segment, and, then re-enters the EL in a further downstream segment within a configurable time interval between Transactions.

#### 2.2.5.7.2 Trip GUI

The TISC provided Trip Building System will include a GUI which will allow authorized SRTA users to search, modify, and audit Trips. This GUI must be intuitive, easy to use, easy to train, and must have a consistent look-and-feel across all provided Trip interfaces. The requirements for the Trip GUI are as follows:

No.	Trip Building GUI Requirements
	<p>The Trip GUI shall allow users to search for Trips using none, one, or more of the following search criteria:</p> <ol style="list-style-type: none"><li>1. Entry Datetime.</li><li>2. Exit Datetime.</li><li>3. Facility.</li><li>4. Direction</li><li>5. Origin-Destination Pair.</li><li>6. Transponder ID.</li><li>7. Transponder Agency.</li><li>8. LPN.</li><li>9. LPJ.</li><li>10. LPT.</li><li>11. Trip ID.</li><li>12. Transaction ID.</li><li>13. Trip Type.</li><li>14. Trip Status.</li><li>15. Last Manual Action.</li><li>16. DWL Trip (Gantry Controlled Access Systems only).</li><li>17. Trip Confidence.</li><li>18. Toll Rate.</li><li>19. Entry TRDMS Location (if TRDMS read is available).</li><li>20. Cloned Tag Flag.</li></ol>
	<p>The Trip GUI shall allow Users to search for a series of Trip IDs by importing a list of Trip IDs in a csv file format.</p>
	<p>The Trip GUI shall display search results in a list with the following fields, as well as the ability to sort by these fields:</p> <ol style="list-style-type: none"><li>1. Entry Datetime.</li><li>2. Exit Datetime.</li><li>3. Facility.</li><li>4. Direction.</li><li>5. Origin-Destination Pair.</li><li>6. Transponder ID.</li><li>7. Transponder Agency.</li><li>8. LPN.</li><li>9. LPJ.</li><li>10. LPT.</li></ol>

No.	Trip Building GUI Requirements
	<ul style="list-style-type: none"> <li>11. Trip ID.</li> <li>12. Transaction ID.</li> <li>13. Trip Type.</li> <li>14. Trip Status.</li> <li>15. Last Manual Action.</li> <li>16. DWL Trip (Gantry Controlled Access Systems only).</li> <li>17. Trip Confidence.</li> <li>18. Toll Rate.</li> <li>19. Entry TRDMS Location (if TRDMS read is available).</li> <li>20. Cloned Tag Flag.</li> <li>21. Datetime sent to CBO.</li> </ul>
	<p>The Trip GUI Search results shall allow users to drill down to see the individual transactions associated with a Trip and the following Transaction information for each Transaction:</p> <ul style="list-style-type: none"> <li>1. Transaction Datetime.</li> <li>2. Transaction ID.</li> <li>3. Lane.</li> <li>4. Toll Point.</li> <li>5. LPN.</li> <li>6. LPJ.</li> <li>7. LPT.</li> <li>8. Transponder ID.</li> <li>9. Transponder Agency.</li> <li>10. Image thumbnail with a link to image sets.</li> <li>11. Flag denoting image was selected as primary image by Trip Building Process.</li> <li>12. Cloned Tag Flag.</li> </ul>
	For single Trips selected, authorized users shall be able to edit Trip information to include, but not limited to, modifying license plate, jurisdiction, plate type, vehicle class, transponder information, and/or rate information before the selected Trip is posted to the CBO.
	For single Trips selected, authorized users shall be able to split Trips.
	Authorized users shall be able to merge selected Trips.
	For single or batch Trips selected, authorized users shall be able to re-rate Trips (modify the toll rate of a Trip).
	For single or batch Trips selected, authorized users shall be able to write off Trips.
	For single or batch Trips selected, authorized users shall be able to remove the DWL flag setting.
	For single or batch Trips selected, authorized users shall be able to post Trips to the CBO.
	For single or batch Trips selected, authorized users shall be able to change Trip status to hold those Trips from posting to SRTA's CBO.
	Authorized users shall be able to perform the manual actions defined in this section on batches of 1 to a minimum of 10,000 Trips.

No.	Trip Building GUI Requirements
	The Trip GUI shall allow authorized users to perform an action on all Trips returned from a search by checking a box.
	All edits made to Trip information and/or modifications made to the formation of a Trip shall be logged.

#### 2.2.5.8 Video Management System (VMS)

The Video Management System (VMS) is the application required to allow users to view live and recorded video feeds from all TRDMS CCTV, Traffic CCTV, and DVAS CCTV cameras provided by the TISC. If the TISC elects to use video analytics for the measurement of Service Level Agreements, that functionality shall also reside within this system. The requirements for the Video Management System (VMS) are as follows:

No.	Video Management System (VMS) Requirements
	The TFH shall interface with all types of CCTV cameras to receive and store video for access via the VMS.
	The TISC shall provide a Video Management System (VMS) that allows any authorized users with SRTA network access (remote or local) to view recorded and real-time video of any camera (TRDMS, DVAS, or Traffic CCTV cameras) with no additional fees or limitations.
	Video for all DVAS and TRDMS CCTV cameras shall be recorded continuously and stored according to the Data Retention Guidelines provided in Attachment 6: Data retention Guidelines and at the following frame rates: <ol style="list-style-type: none"> <li>1. TRDMS CCTV: 10 FPS.</li> <li>2. DVAS CCTV: 30 FPS</li> </ol>
	The TISC video storage solution may utilize local storage on the ETCS network, storage in the cloud or a combination of the two.
	The VMS shall allow authorized users to access PTZ functionality for applicable cameras.
	Access to view CCTV camera video, and access to use PTZ functionality on CCTV cameras shall be treated as separate permissions to be assigned to specific user roles.
	The VMS shall restrict PTZ functionality for certain user roles by camera type. For example, only maintenance personnel should be allowed to modify TRDMS CCTV PTZ.
	The VMS shall allow users to playback recorded video in real-time, slow motion, fast-forward, fast reverse, and frame-by-frame.
	The VMS shall allow users to “scroll” through selected recorded video with a mouse.
	The VMS shall allow users to view recorded and real-time video from at least 16 cameras, simultaneously, in separate and selectable windows.
	The VMS shall allow users to view video from all camera types (TRDMS, DVAS, or Traffic CCTV cameras) simultaneously.
	The VMS shall allow users to maintain a favorite camera list to which they can add and remove specific cameras.
	The VMS shall allow users to save personalized sets of cameras that can be selected in order to open and organize multiple camera feeds on the user’s display.

No.	Video Management System (VMS) Requirements
	The VMS shall provide the ability to stream video from multiple remote locations (i.e., when the user is off-site from SRTA).
	When playing recorded or real-time DVAS CCTV camera video, the VMS application shall overlay Transactional data that is coupled with the applicable recorded video.
	Transactional data shall include datetime, Facility, Toll Point location, Transponder ID, vehicle class (where available) and a link to the appropriate VTS image set.
	The VMS shall provide video playback by user selected datetime, Facility, Lane, Camera ID, Transponder ID, Vehicle Class, LPN (if available), and Transaction ID.
	The VMS shall allow users to flag Transactional data that does not match the video being displayed.
	The VMS shall allow users to print selected video images and their associated Transactional data.
	The VMS shall allow users to save video snapshots for selected cameras.
	If video analytics is used for measuring the accuracy of Toll Point and Traffic Sensor volume, speed, and/or classification Service Level Agreements, the VMS shall allow users to view and download Lane speed, volume, and classification data collected from the video analytics system, for each camera, aggregated on a configurable time interval (5 minutes, 10 minutes, 30 minutes, and 60 minutes) or by individual detected vehicle, and for a selected time range.
	The VMS shall allow users to save and view recorded video from the time range specified for Lane speed, volume, and classification data collection via the video analytics system.

#### 2.2.5.9 Travel Time Reader Processing

The TFH will use data collected from the travel time readers for identifying when express lanes users passed the TRDMS for rate allocation and to calculate vehicle travel times for reporting and communication to third parties via the interfaces. The Travel Time Reader Processing requirements are as follows:

No.	Travel Time Reader Processing
	The TFH shall retrieve and store all transponder reads from the AVI travel time readers.
	On configurable periodic basis, the TFH shall calculate and store travel time records based on reads at subsequent readers within configurable parameters that define a continuous unbroken trip.
	The calculation of travel times shall only be performed once complete data has been retrieved from all AVI travel time readers or after a configurable delay to allow for data latency.

#### 2.2.5.10 Configurable System Parameters Management

SRTA requires Configurable System Parameters that will be integral to developing the subsystems of the TFH. Configurable System Parameters are the arbitrary constants whose values define how a subsystem operates. An example of a Configurable System Parameter is the max toll rate parameter. The max toll rate value is a constant that determines the cap on rates calculated and published to the TRDMS.

The collection of values assigned to all Configurable System Parameters is called the System Configuration Parameter Setting. The System Configuration Parameter Setting tracks the values assigned to all configurable system parameters at any point in time like versioning software that tracks the previous and current state of a document after one or more changes are made. Thus, each time a modification is made to one or more Configurable System Parameters and the changes are made live in the production ETCS, the System Configuration Parameter Setting will be considered changed to a new state. These different states are to be tracked by the TFH to allow a user to view the value for all Configurable System Parameters that were in effect at any point in time. The requirements for Configurable System Parameter management are as follows:

No.	Configurable System Parameters Management Requirements
	The TFH shall provide the ability for authorized SRTA users to modify the value of any of the Configurable System Parameters.
	The Configurable System Parameters shall be sourced from the RFP requirements or shall be included at the discretion of the TISC to provide the required functionality of the TFH.
	The ability to update Configurable System Parameters shall be controlled by user and role attributes based on the User Access Level Matrix described in Section 2.2.5.1: TFH Connectivity and User Access.
	The TFH shall keep a record of all modifications by date/time and user-ID made to the Configurable System Parameters.
	The TFH shall report the System Configuration Parameter Settings in effect for a selected datetime through the Configuration Setting History Report as defined in Section 2.2.5.15.1.6: Configuration Reports.
	The TFH shall provide a GUI to update the value of the Configurable System Parameters.
	A definition for each Configurable System Parameter shall be included in the GUI.
	The GUI for configurable system parameters shall group the parameters logically, such as by Facility and Direction, based on how the parameter is applied in the system.
	The logical groupings of Configurable System Parameters shall be reviewed and approved by SRTA.
	The TFH shall allow authorized users to schedule updates to key System Configuration Parameters to go into effect immediately or at a future datetime, including toll rate limits.
	The number of days in the future a System Configuration Parameter Setting is able to be scheduled shall be configurable.
	The TFH shall allow users to view the System Configuration Parameter Settings that are currently in effect.
	The TFH shall allow users to view the System Configuration Parameter Settings that were in effect on a specified datetime.
	The TFH shall allow authorized users to select previous System Configuration Parameter Settings to be duplicated, edited, and placed into effect.
	All modifications made to the System Configuration Parameter Settings shall go into effect at the scheduled datetime without delay.



### 2.2.5.11 Roadway Reversal Functionality

The TFH is required to monitor automated lane reversals (transitions) and to provide for manual lane transitions for reversible facilities. Reversible Facilities, specifically I-75A and I-75B, can transition from Northbound to Southbound, Northbound to Closed, Southbound to Northbound, Southbound to Closed, Closed to Northbound, and Closed to Southbound. GDOT is responsible for determining when Facility transitions occur, and for leading the transition following a series of steps prescribed by SRTA/GDOT operational policy.

During any Facility transition, GDOT personnel operate the Roadway Access Control System (RACS) to open/close barrier gates and change the messages on GDOT-controlled DMSs to indicate the appropriate state of the facility and access points (CLOSED, NORTH, and SOUTH). The TFH will be independent of and have no control over the GDOT RACS including the RACS controllers, barrier gates, or other non-TISC maintained equipment. GDOT will send automated transition commands to the TFH via the TFH to GDOT ATMS Interface in Attachment 9. As an automated facility transition proceeds, the TFH will receive individual commands from the GDOT ATMS to change toll point mode and TRDMS messages. SRTA TOC Operators will monitor the TFH as it automatically changes the direction of Zone Controllers and the messages/rates displayed on the TRDMSs. SRTA TOC Operators will monitor all facility transitions through the Toll Operations Center System (TOCS) described in Section 2.2.5.18: Toll Operations Center System (TOCS).

In the event GDOT RACS is unable to send automated transition commands, SRTA TOC Operators will manually transition the facility according to the operational policies and in coordination with GDOT TMC Operators. The TOCS will be used by the SRTA TOC Operators to carry out manual transition commands.

The requirements for the roadway reversal functionality are as follows:

No.	Roadway Reversal Requirements
	The TFH shall interface with GDOT's ATMS to open, close, and reverse a Facility.
	The TFH shall automatically open, close, or reverse the travel direction of Express Lanes at the zone controllers based on a series of commands from the GDOT ATMS (see Section 2.2.5.12.2: GDOT ATMS and <b>Error! Reference source not found.</b> for details on the Interface).
	The TFH shall automatically change the message and/or rates displayed on the TRDMS based on a series of commands from the GDOT ATMS.
	The TFH shall have the ability to send the same message to a single TRDMS or to a specified group of multiple TRDMSs for the changing of messages and/or rates displayed.
	The TFH shall automatically respond to GDOT automatic reversal commands according to the GDOT ATMS ICD.
	The TFH shall provide a user interface for authorized users with the ability to manually set the direction of travel for the zone controllers in the ETCS at any given time via the SRTA Toll Operation Center System (see Section 2.2.5.18: Toll Operation Center System (TOCS)).
	The TFH shall provide SRTA TOC Operations staff the ability to manually change the messages and/or rates displayed on the TRDMS at any given time via the SRTA Toll Operation Center System.
	The TFH shall allow only users with appropriate user permissions/roles to reverse the roadway manually.

No.	Roadway Reversal Requirements
	The TISC shall provide the functionality for authorized SRTA staff to disable the communication between the GDOT ATMS and the TFH.

#### 2.2.5.11.1 Wrong Way Vehicle Detection

The requirements for the Wrong Way Vehicles (WWV) alarm are as follows:

No.	Requirement
	The ETCS shall generate a WWV alert whenever a vehicle is detected travelling in a direction opposite to the current direction of the detecting Toll Point.
	The ETCS shall generate a WWV alert whenever a vehicle is detected travelling through a closed Toll Point.
	The WWV alert shall generate a visual and audio alarm in the TOCS according to the requirements defined in Section 2.2.5.18 Toll Operation Center System (TOCS).
	For each WWV alert, the TFH shall display the following information at a minimum: <ol style="list-style-type: none"> <li>1. Facility.</li> <li>2. Facility Operating Direction/Closed Status.</li> <li>3. Direction of travel of the vehicle traveling the wrong way.</li> <li>4. Lane.</li> <li>5. Transponder ID (if detected).</li> <li>6. DVAS Camera ID (if available).</li> <li>7. Image (if available).</li> <li>8. Datetime of the wrong way detection.</li> </ol>
	The WWV alerts shall be available via the reporting system.

#### 2.2.5.12 Interfaces

This section identifies the interfaces the TISC will be required to design, test, implement, and maintain as part of the requirements for this ETC. The TFH will be required to communicate with various components of the ETCS, as well as with third-party entities. The communications between the TFH component systems, the TFH and SRTA, and the TFH and third parties will be described by Interface Control Documents (ICDs).

The general requirements for all ETCS Interfaces are as follows:

No.	ETCS Interface General Requirements
	Only non-proprietary, industry standard protocols and data structures shall be used to establish the communication interfaces required between all systems, components, peripherals, and subsystems of the ETCS.
	At a minimum, all messages from the Zone Controllers, TRDMSs, Traffic Sensors, CCTV cameras, and Travel Time Site AVI subsystems to the TFH and/or 3 <sup>rd</sup> party applications shall

No.	ETCS Interface General Requirements
	utilize documented, open (available to SRTA) transmission protocols or protocol stacks and messaging.
	For any interface that utilizes an existing ICD, the TISC shall use the ICD as is with modifications made only where necessary and as approved by SRTA.
	All interfaces shall be designed to protect and secure data.
	All interfaces shall incorporate generation of events to trigger alerts for abnormal operation.

#### 2.2.5.12.1 Commercial Back Office Interface

All Trips created in the TFH will be transmitted to SRTA's CBO. The requirements for the CBO Interface are as follows:

No.	Commercial Back Office Interface Requirement
	The TFH shall transmit all Trips formed by the Trip Building System to the CBO by way of the latest version at the time of implementation of the Standard Transaction Interface (STI) as included in Attachment 10: STI ICD.
	THE TFH shall make images available to SRTA's CBO as required by the STI.
	Transponder Validation Lists (TVL)s are available for the TFH to receive from the CBO but are not required for use. If used, the TISC must specify how and where it is used.
	The TISC shall coordinate with SRTA and SRTA's CBO vendor during the requirements and design phases to clarify any technical details related to the STI.
	The TISC shall coordinate with SRTA's CBO vendor to resolve issues regarding the deployment, testing and ongoing operation of the interface.

#### 2.2.5.12.2 GDOT ATMS Interface

For the Reversible Facilities, the ETCS sets the direction of travel in response to commands received from the GDOT ATMS. The GDOT ATMS Interface enables the Roadway Access Control System (RACS) to communicate to the ETCS the direction of travel of the Facilities set by the GDOT TMC through a series of discrete messages in order to implement Roadway Reversal Functionality.

The requirements for the GDOT ATMS Interface are as follows:

No.	GDOT ATMS Interface Requirements
	The TFH shall interface with the GDOT's ATMS in accordance with the GDOT ATMS ICD as included in Attachment 9: GDOT ATMS ICD.
	The TISC shall participate in workshops coordinated by SRTA and GDOT during the requirements and design phases to clarify any technical details related to the ICD.
	The TISC shall participate in workshops coordinated by SRTA and GDOT to resolve issues regarding the deployment and testing of the interface.
	Once in production, the TISC shall coordinate with SRTA and GDOT to resolve any issues that arise with the interface.

#### 2.2.5.12.3 Georgia Institute of Technology Interface

SRTA maintains a cooperative traffic data sharing arrangement with Georgia Tech. As part of this arrangement, SRTA has agreed to send near real-time (web services) traffic information for the purposes of higher learning and traffic studies. The current ICD for sharing data can be found in Attachment 11: Georgia Tech ICD. This version incorporates the desired traffic data requirements requested by Georgia Tech and shall serve as a starting point for capturing the requirements of the TISC's ICD.

The requirements for the SRTA to Georgia Tech Interface and other applicable 3<sup>rd</sup> party data users are as follows:

No.	SRTA to Georgia Tech Interface Requirements
	The TISC shall design and implement an interface based on the results of coordinating with SRTA, Georgia Tech, and other applicable 3 <sup>rd</sup> parties during the development, design, review, and approval process of the TFH to Georgia Tech ICD.
	The TFH to Georgia Tech interface (and its associated ICD) shall be developed, tested, implemented, and maintained by the TISC for the duration of the Contract.

#### 2.2.5.12.4 Managed and Tolloed Lane Feed Specification Interface

SRTA intends to provide accurate and standardized information on the Express Lanes network for third parties to use in mobile and web app development. SRTA desires the format of the data to be modeled after the standardized General Transit Feed Specification (GTFS) format for transit data. Per GTFS documentation, the GTFS feed "is composed of a series of text files collected in a ZIP file. Each file models a particular aspect of transit information: stops, routes, Trips, and other schedule data." The tolling version of the GTFS, the Managed and Tolloed Lane Feed Specification (MTLFS), will be composed similarly, but will include information on the facility, access points, TRDMS locations, toll rates, toll policy, and agency. A prototype of a potential MTLFS schema is provided at <https://github.com/vta/Managed-and-Tolloed-Lanes-Feed-Specification>.

SRTA will publish the MTLFS ZIP file to the SRTA website.

The minimum requirements for the Managed and Tolloed Lane Feed Specification are as follows:

No.	MTLFS Interface Requirements
	The TISC shall design and implement an interface based on the results of coordinating with SRTA, and other applicable 3 <sup>rd</sup> parties during the development, design, review, and approval process of the SRTA MTLFS ICD.
	The SRTA MTLFS interface shall provide current real-time toll rates for all segments of each facility for use on the Peach Pass website.
	The SRTA MTLFS interface (and its associated ICD) shall be developed, tested, implemented, and maintained by the TISC for the duration of the Contract.
	The information provided by the MTLFS shall include the following, at a minimum: <ol style="list-style-type: none"><li>1. Facility Data.</li><li>2. Facility Path (alignment of Facility using latitude and longitude points in a sequence).</li></ol>

No.	MTLFS Interface Requirements
	3. Entry and Exit Point Data. 4. TRDMS Data. 5. OD Pair Data 6. Toll Rates by OD Pair. 7. Toll Rate Policy. 8. Vehicle Data. 9. Agency Data.
	The MTLFS shall provide its information through a series of text files compressed into a zip file.
	The TFH shall provide a mechanism for authorized users to modify data within the static data sets of the MTLFS (e.g., coordinates for TRDMS, and pricing policies).
	The CPS shall allow authorized users to download the static MTLFS data ZIP file.
	The information provided by the MTLFS shall be defined during the Design Phase.

#### 2.2.5.12.5 I-75 Transaction Converter Interface

The requirements for the I-75 Transaction Converter Interface are as follows (Requirements specific to the Transaction Converter itself can be found in Section 3.3 Toll Facility Host (TFH) Transaction Converter.):

No.	I-75 Transaction Converter Interface Requirements
	The TISC shall design and implement an interface based on the results of coordinating with SRTA, Neology, and other applicable 3 <sup>rd</sup> parties during the development, design, review, and approval process of the ICD.
	The interface from the existing I-75 TSI system to the TISC Transaction Converter (and its associated ICD) shall be developed, tested, implemented, and maintained by the TISC for the duration of the Transition period.

#### 2.2.5.12.6 I-85 Transaction Converter Interface

The requirements for the I-85 Transaction Converter Interface are as follows (Requirements specific to the Transaction Converter itself can be found in Section 3.3 Toll Facility Host (TFH) Transaction Converter.):

No.	I-85 Transaction Converter Interface Requirements
	The TISC shall design and implement an interface based on the results of coordinating with SRTA, ETC, and other applicable 3 <sup>rd</sup> parties during the development, design, review, and approval process of the ICD.
	The interface from the existing I-85 TSI system to the TISC Transaction Converter (and its associated ICD) shall be developed, tested, implemented, and maintained by the TISC for the duration of the Transition period.

#### 2.2.5.13 ETCS Database Replica

SRTA is the owner of all data captured for this Project. SRTA retains exclusive rights to all data produced by the ETCS. Specific datasets from the TISC's database shall be transmitted to SRTA's Data Warehouse for SRTA's use.

The TISC shall provide a replica of the ETCS database and provide SRTA with full access to it. Below are listed the requirements for the Database Replica:

No.	ETCS Replica Database Requirements
	The ETCS Database Replica shall be a relational database, preferably in SQL Server.
	The TISC shall provide secure and individual log-in SQL user credentials to SRTA and SRTA consultants' staff.
	The ETCS Database Replica shall not impact production database performance.
	The ETCS Database Replica shall be updated to production database status at least one time per day, preferably during night hours.
	ETCS Database Replica shall be hosted in SRTA's tenant and cloud environment.
	The TISC shall provide to SRTA a full description of the Database Replica including the Data Dictionary, ARD and ER schemas and a list of business-approved tables.
	The TISC shall support requests for data from all approved data sets including the ad hoc transfer of data from the production database to the Database Replica as and when requested by SRTA.
	The TISC shall update the Database Replica accordingly and in parallel with the production database, every time the structure of the production database is updated/ changed.
	The TISC shall use SRTA's approved change management control procedure to notify SRTA of any changes to the TISC production database (structure or data) that may impact the Database Replica.
	Notification of changes to the TISC production database that impact the Database Replica shall be sent at least 2 weeks prior to implementation of such changes.

#### 2.2.5.14 Data Retention, Backup, and Recovery

The TISC is required to configure and implement their ETCS solution to meet the requirement for data retention according to SRTA's Data Retention Guidelines (see Attachment 06: Data Retention Guideline). This includes the storage of data to allow SRTA access and the long-term archive and deletion strategies. The two types of retention requirements are Online Retention Requirements and Archive Requirements. They are defined as follows:

1. **Online Retention Requirements** shall mean the minimum length of time the TISC shall keep data visible to SRTA and easily accessible by SRTA in the TFH.
2. **Archive Requirements** shall mean the minimum length of time the TISC shall be required to maintain data online after which, due to the passing of the required time period(s) set forth in the Data Retention Guideline, data may be moved from the TFH to a separate long-term storage device(s) maintained by TISC.

In addition, the TISC is required to perform regular backups of system data to be used in the event of a failure or data loss. The process of recovering a backup after a failure should result in minimal impact to the production system. The requirements for TFH Data Retention, Backup, and Recovery are as follows:

No.	Data Retention, Backup, and Recovery Requirements
	TISC shall propose an efficient and accessible solution for storing and accessing data blocks, files, and images.
	Data retention and archiving shall be implemented according to the TISC developed Data Retention and Archive Plan.
	Data shall be retained and archived by the TISC in accordance with the requirements set forth in Attachment 06: Data Retention Guideline.
	TISC data retention, backup and recovery plans and procedures shall be compliant with SRTA's Security, Backup and Media Protection Policies.
	The TISC shall follow SRTA's data retention policy for all data retained by the TFH.
	TISC shall store all toll transaction records, trip transactions, toll lane events, traffic data, rate calculations, maintenance messages, user activity, user audit records, alerts and work order records.
	Any other data not specifically set forth in the Data Retention Guideline shall be retained by the TISC online in the TFH for a minimum of thirteen (13) months after which it may be purged or archived, according to the approach that will be defined and approved during the design phase.
	Deletion of data that has reached or exceeded the Online Retention Requirements and has been successfully archived shall be automatic.
	Data shall be archived to the TISC's permanent long-term storage (e.g., NAS in csv format) solution only after the applicable Online Retention Requirement time-period has expired.
	All archived data shall be available to SRTA within twenty-four (24) hours of SRTA's request.
	The TISC shall provide a mechanism for saving summary data for use in summary reports to enable these reports to be run for historic periods where the detailed data has been archived.
	This TISC shall implement the summary data creation for summary reports that SRTA identifies as being needed for historic periods.
	The TISC shall submit a schedule for purging data that is included in summary reports and not needed for separate reporting and trend analysis.
	The TISC shall provide automated capability to back-up the TFH daily using appropriately sized and configured, cloud-based, and/or disk subsystems.
	The backup process shall include a scheduled process for daily, weekly, and monthly full and incremental backups.
	The TISC shall maintain an "immutable" backup of critical systems and data for disaster recovery purposes such as ransomware infection.
	The TISC will retain authorized copies (backups) for all software media to use for periodic system maintenance, upgrades, or restorations, as required by SRTA IT Backup Policy.
	The backups shall include all application, database, and storage systems.

No.	Data Retention, Backup, and Recovery Requirements
	The backups shall include all roadside systems.
	The backup process shall generate MOMS messages to provide descriptions and notifications of the success and/or failure of backup systems or jobs.
	All archived data on all media shall be indexed to determine the content and time period.
	All backups shall be encrypted.
	Recovery processes shall be defined for all backups.

#### 2.2.5.15 Standard Reporting Requirements

The reports and dashboards contained within the reporting system will be used by SRTA staff to perform a variety of tasks associated with the implementation, testing, operation, and maintenance of the ETCS. Because reports will be used frequently by SRTA staff, the reporting system must be easy to access, understand, and use. Similarly, the data contained within the reports must be clear in its meaning, consistent in its use and nomenclature, and supported by accurate documentation.

SRTA desires an approach to designing and developing reports and dashboards that gives SRTA the ability to gain experience with the TISC's TFH prior to finalizing the design of the ETCS reports and dashboards. This is meant to increase the likelihood that the reports and dashboards developed by the TISC meet the requirements of this RFP without the review/ rework cycle that typically occurs in tolling projects.

Data contained in reports and dashboards will be available according to the Data Retention Policy in Attachment 06: Data Retention Guideline, with summary and historic reports to be defined by SRTA during the design phase, available for longer periods.

The requirements for the Standard Reporting system are as follows:

No.	Standard Reporting Requirements
	The TISC shall develop and deliver a reporting system to support the monitoring and performance assessment of the roadside equipment, TFH, maintenance subsystems, interfaces, and other components of the ETCS.
	Reports shall be available to SRTA 24/7.
	All reports and dashboards provided by the TISC shall be available in one central GUI.
	The design and development of the TFH Reports and Dashboards shall adhere to all requirements defined in Section 4.6.2.3: Reports and Dashboards Design and Development Process.
	SRTA users shall have the ability to create and save ad-hoc reports and/or dashboards within the reporting system.
	SRTA users shall have the ability to modify ad-hoc reports and dashboards within the reporting system.
	SRTA users shall have the ability to share ad-hoc reports and dashboards within the reporting system.
	SRTA users shall have the ability to delete ad-hoc reports and dashboards within the reporting system.



No.	Standard Reporting Requirements
	All fields and data used to populate the SRTA defined reports and dashboards shall be available for use in ad-hoc reports.
	SRTA defined reports and dashboards created by the TISC shall be available as templates in the ad-hoc reporting system for modification by SRTA users.
	SRTA users shall not be allowed to modify or delete any SRTA defined reports or dashboards.
	Access to reports and dashboards shall be controlled by user and role attributes based on the User Access Level Matrix described in Section 2.2.5.1: TFH Connectivity and User Access.
	The ability to create reports and dashboards shall be controlled by user and role attributes based on the User Access Level Matrix described in Section 2.2.5.1: TFH Connectivity and User Access.
	The ability to modify reports and dashboards shall be controlled by user and role attributes based on the User Access Level Matrix described in Section 2.2.5.1: TFH Connectivity and User Access.
	SRTA users shall be able to view multiple, at least 10, reports and/or dashboards simultaneously.
	All reports and dashboards shall have the capability to be scheduled for automatic generation on a user defined frequency/time.
	All scheduled reports and dashboards shall have the capability to run on user demand.
	The reporting system shall be capable of automatically emailing reports to one or more configured recipients.
	The reporting system shall be capable of automatically saving scheduled reports.
	Reports and dashboards shall be exportable in a range of output options including PDF, CSV, Excel, or screen display.
	Exported reports shall include data selected by the active filter and search criteria.
	Reports and dashboards shall print in paper sizes ranging from letter to tabloid.
	All reports shall be capable of being run for up to a year's worth of data or a portion thereof as specified by the user for report results of up to 10 million records.
	For reports that will return more than 10 million records the report shall be capable of being run for at least one month at a time.
	In addition to the TISC's standard suite of reports and the SRTA defined reports and dashboards, the TISC shall be responsible for designing, developing, implementing, and testing up to fifteen (15) new custom reports based on SRTA's requirements during the term of the Contract.
	During the first six (6) months after ETCS Go-Live for each Facility, the TISC shall deliver updates of up to fifteen (15) custom or standard reports and dashboards based on SRTA staff use at no additional cost.
	All reports used to diagnose system issues pre- and post-ETCS Go-Live shall be made available to SRTA.

#### 2.2.5.15.1 SRTA Defined Reports

The following requirements provide a general definition for all defined reports and, for a few, specific fields to include in the report. During the reports and dashboards development process defined in Section 4.6.2.3: Reports and Dashboards Design and Development Process, the purpose and content of these reports will be finalized.

The requirements for SRTA Defined reports are as follows:

No.	SRTA Defined Reports Requirements
	The SRTA defined reports shall be available to SRTA at the start of the first TFH Revenue Ready Test.
	The SRTA defined reports shall employ a standardized report format with headers and footers on all pages containing the following: <ol style="list-style-type: none"><li>1. SRTA logo.</li><li>2. Report title.</li><li>3. Selection criteria used to generate the report.</li><li>4. Datetime when the report was generated.</li><li>5. Username that generated the report.</li><li>6. Page number and total number of pages contained in the report.</li><li>7. Total number of records.</li><li>8. Subtotals presented on the first page or page that report opens to.</li><li>9. Legend on last page of report of all column headers.</li></ol>
	All defined reports shall be filterable and sortable by any of the fields contained in the report.
	Report filtering and sorting shall allow selection of ranges and single or multiple selections for each field as compatible with the field.
	Summary reports shall be fully reconcilable with detail level reports with the same filters applied, and with values aggregated to match the summary.
	The format and content of each individual report shall be approved during the Reports Design and Development Process.

##### 2.2.5.15.1.1 Audit and Reconciliation Reports

Audit and Reconciliation Reports provide a way for SRTA to reconcile Transactions, Trips, and images from the roadside systems at the lane to the posting of fully formed Trips to SRTA's CBO. The Audit and Reconciliation Reports also provide information to track user activity.

The requirements for Audit and Reconciliation reports are as follows:

No.	Audit and Reconciliation Reports Requirements
	The Exception Detail Report shall contain all Transactions that are exceptioned at any point from Transaction generation to Trip building for all reasons specified during system design.
	The Exception Summary Report shall summarize the count of exceptioned Transactions by Facility, Direction, Transaction Date, and Exception Reason.

No.	Audit and Reconciliation Reports Requirements
	The CBO Standard Transaction Interface (STI) Reconciliation Report shall summarize the number of Trips sent to the CBO and the number of Trips acknowledged as received by the CBO by Facility, direction, sent datetime, received datetime, the number of rejected Trips and the reasons for rejected Trips.
	The Revenue Audit and Reconciliation Detail Report shall contain information on all Trips posted to the CBO.
	<p>The Revenue Audit and Reconciliation Detail Report shall include the following fields:</p> <ol style="list-style-type: none"> <li>1. Facility.</li> <li>2. Direction.</li> <li>3. Trip ID.</li> <li>4. OD Pair.</li> <li>5. Trip Start Datetime.</li> <li>6. Trip End Datetime.</li> <li>7. Trip Type.</li> <li>8. DWL Violation Flag.</li> <li>9. Toll Rate.</li> <li>10. Transponder ID.</li> <li>11. Transponder Agency.</li> <li>12. LPN.</li> <li>13. LPJ.</li> <li>14. LPT.</li> <li>15. Posted Datetime.</li> <li>16. Posting Status.</li> <li>17. CBO Acknowledgement Date.</li> <li>18. Acknowledgement Description.</li> </ol>
	The Revenue Audit and Reconciliation Summary Report shall summarize the count of Trips, sum of revenue, average toll rate, and maximum toll rate for all Trips sent to the CBO by Facility, Direction, OD pair, Trip Start Date, Posting Status, and Acknowledgement Description.
	The Transaction Audit and Reconciliation Summary Report shall summarize the count of Transactions captured by the Zone Controller, the count of Transactions received by the TFH, the count of Transactions formed into Trips, and the count of Transactions exceptioned out of Trip Building by Facility, Direction, and Transaction Date.
	The User Report shall contain basic information on all users registered in the system including the latest datetime of each user profile modification.
	<p>The User Report shall include at a minimum the following fields:</p> <ol style="list-style-type: none"> <li>1. User ID.</li> <li>2. Name.</li> <li>3. Entity (SRTA, TISC, etc.).</li> <li>4. User Created Datetime.</li> <li>5. User Roles.</li> </ol>

No.	Audit and Reconciliation Reports Requirements
	6. User Permissions. 7. Last Logged In. 8. Last Modified Datetime. 9. Last Modified by User ID.
	The Cloned Tag Report shall display flagged “cloned tag” transponders identified during Transaction Processing as specified in Section 2.2.5.3: Transaction Processing.

#### 2.2.5.15.1.2 Image Processing System (IPS) Reports

IPS Reports provide transparency on information generated from the TISC’s IPS such as the history of image reviews in the system and the final disposition of reviewed images. These reports also provide information to SRTA regarding the audits performed by SRTA staff.

The requirements for IPS reports are as follows:

No.	Image Processing System (IPS) Reports Requirements
	The Image Disposition Report shall contain information on all image Transactions reviewed by the IPS.
	The Image Disposition Report shall include at a minimum the following fields: <ol style="list-style-type: none"> <li>1. Facility.</li> <li>2. Direction.</li> <li>3. Toll Point.</li> <li>4. Lane.</li> <li>5. Transaction ID.</li> <li>6. Transaction Creation Datetime.</li> <li>7. Camera ID.</li> <li>8. Transponder ID.</li> <li>9. Transponder Agency.</li> <li>10. Transponder Status.</li> <li>11. Image URL (best image selected by IPS as defined in Section 2.2.5.42.2.5.4: Image Processing System (IPS)).</li> <li>12. ALPR LPN.</li> <li>13. ALPR LPJ.</li> <li>14. ALPR LPT.</li> <li>15. Final LPN.</li> <li>16. Final LPJ.</li> <li>17. Final LPT.</li> <li>18. Code Off Reason.</li> <li>19. WWV Flag.</li> <li>20. Review Type:             <ol style="list-style-type: none"> <li>a. Automatic Review.</li> <li>b. Manual Review.</li> </ol> </li> </ol>

No.	Image Processing System (IPS) Reports Requirements
	<ul style="list-style-type: none"> <li>c. Other (identified during design phase).</li> <li>21. Number of times audited.</li> <li>22. Number of Images.</li> <li>23. Current Image Processing Status Datetime.</li> <li>24. Current Image Processing Status: <ul style="list-style-type: none"> <li>a. Created.</li> <li>b. Under Review.</li> <li>c. Coded Off.</li> <li>d. Final Plate Result.</li> <li>e. Other (identified during design phase).</li> </ul> </li> </ul>
	The QA Audit Detail Report shall contain the results of the Image Audit Manager QA audit of Image Auditors.
	The QA Audit Detail Report shall contain information on all image Transactions audited by Image Audit Managers.
	The Image Audit Set Backlog Report shall contain information on images in audit queues waiting to be audited.
	The Image Audit Set Backlog Report shall include the user assigned to each unfinished audit queue, the number of images in each Audit Set, the number of images completed in each Audit Set, the status of each Audit Set, and the datetime the Audit Set was created.
	The Image Audit Set History Detail Report shall contain information on all image Transactions audited by Image Auditors or Image Audit Managers.
	The Image Audit Set History Detail Report shall not contain audit results of Image Audit Managers auditing Image Auditors.
	<p>The Image Audit Set History Detail Report shall include at minimum the following fields:</p> <ul style="list-style-type: none"> <li>1. Image Auditor.</li> <li>2. Audit Set ID.</li> <li>3. Audit Result.</li> <li>4. Audit Completion Datetime.</li> <li>5. Facility.</li> <li>6. Direction.</li> <li>7. Toll Point.</li> <li>8. Lane.</li> <li>9. Transaction ID.</li> <li>10. Transaction Creation Datetime.</li> <li>11. Transponder ID.</li> <li>12. Transponder Agency.</li> <li>13. Transponder Status.</li> <li>14. LPN.</li> <li>15. LPJ.</li> <li>16. LPT.</li> </ul>

No.	Image Processing System (IPS) Reports Requirements
	17. Review Type. 18. Review Datetime. 19. Code-off Code. 20. Image URL.
	The Image Audit Set History Summary Report shall summarize the results for completed Audit Sets by Facility, Direction, Toll Point, Code-Off Code (including no code-off), and Audit Result (Pass, Fail, or Skip).
	The Image Audit Reviewer Performance Report shall display the daily count of images audited by Image Auditor and the resulting pass, fail, and skip percentages.
	The Image Code-off Detail Report shall contain information for each image coded off by automated and/or manual reviews.
	The Image Code-off Detail Report shall include at a minimum the following fields: 1. Facility. 2. Direction. 3. Toll Point. 4. Lane. 5. Transaction ID. 6. Transaction Creation Datetime. 7. Camera ID. 8. Transponder ID. 9. Transponder Agency. 10. Transponder Status. 11. Image URL. 12. ALPR LPN. 13. ALPR LPJ. 14. ALPR LPT. 15. Code Off Reason. 16. Review Type. 17. Review Datetime. 18. Number of times audited.
	The Image Code-off Summary Report shall summarize the count of coded-off images by Facility, Direction, Toll Point, Lane, Camera ID, Coded-off By, and Code Off Reason.

#### 2.2.5.15.1.3 Trip and Transaction Reports

The purpose of the Trip and Transaction Reports is to provide all relevant information collected in the Transaction, details on Trips formed from these Transactions, and all actions related to the modifications and posting of Trips.

The requirements for Trip and Transaction reports are as follows:

No.	Trip and Transaction Reports Requirements
	The Transaction Detail Report shall contain information on all Transactions received by the Toll Facility Host.
	<p>The Transaction Detail Report shall include at a minimum the following fields:</p> <ol style="list-style-type: none"> <li>1. Transaction ID.</li> <li>2. Facility.</li> <li>3. Direction.</li> <li>4. Toll Point.</li> <li>5. Lane.</li> <li>6. Transaction Creation Datetime.</li> <li>7. Transponder ID.</li> <li>8. Secondary Transponder ID (if applicable).</li> <li>9. Transponder Agency.</li> <li>10. Secondary Transponder Agency (if applicable).</li> <li>11. Transponder Status (from TVL if available).</li> <li>12. Transponder Protocol.</li> <li>13. Image URL.</li> <li>14. ALPR LPN.</li> <li>15. ALPR LPJ.</li> <li>16. ALPR LPT.</li> <li>17. Final LPN.</li> <li>18. Final LPJ.</li> <li>19. Final LPT.</li> <li>20. Vehicle Classification.</li> <li>21. AVI Poll Count</li> <li>22. Speed.</li> <li>23. Transaction Status.</li> <li>24. Transaction Status Datetime.</li> <li>25. Degraded flag.</li> <li>26. Wrong Way Indicator (if applicable).</li> <li>27. Camera ID.</li> <li>28. Cloned Tag Flag.</li> </ol>
	The Transaction Summary Report shall summarize the count of Transactions by Facility, direction, Transaction creation datetime, Toll Point, and lane number.
	The Trip Detail Report shall contain information on all Trips created by the Trip Building System.
	<p>The Trip Detail Report shall include at a minimum the following fields:</p> <ol style="list-style-type: none"> <li>1. Trip ID.</li> <li>2. Facility.</li> <li>3. Direction.</li> <li>4. Trip Start Datetime.</li> </ol>

No.	Trip and Transaction Reports Requirements
	<ul style="list-style-type: none"> <li>5. Trip End Datetime.</li> <li>6. Transponder ID.</li> <li>7. Transponder Agency.</li> <li>8. Transponder Status (from TVL if available).</li> <li>9. Transponder Protocol.</li> <li>10. LPN.</li> <li>11. LPJ.</li> <li>12. LPT.</li> <li>13. Image URLs.</li> <li>14. Vehicle Classification.</li> <li>15. Toll Rate.</li> <li>16. DWL Violation Flag.</li> <li>17. Trip Confidence.</li> <li>18. Travel Time.</li> <li>19. Trip Creation Datetime.</li> <li>20. Trip Posted Datetime.</li> <li>21. Trip Status: <ul style="list-style-type: none"> <li>a. Created.</li> <li>b. Excepted. <ul style="list-style-type: none"> <li>i. Split – with reason.</li> <li>ii. Merged – with reason.</li> <li>iii. Write Off – with reason.</li> <li>iv. Other (identified during Design Phase).</li> </ul> </li> <li>c. Posted.</li> <li>d. Reconciled.</li> <li>e. Human Review.</li> <li>f. Mandatory Hold.</li> </ul> </li> <li>22. Trip Status Datetime.</li> <li>23. OD Pair.</li> <li>24. Transaction Count.</li> <li>25. Trip Type.</li> <li>26. TRDMS Location.</li> <li>27. Clone Tag Flag.</li> </ul>
	The Trip Summary Report shall summarize the count of Trips, the sum of fares, the average Trip speed, by Facility, direction, Trip start date, and OD Pair.
	The Trip Listing Report shall contain a list of all Trips created by the Trip Building System with less detail than the Trip Detail Report.
	<p>The Trip Listing Report shall include at a minimum the following fields:</p> <ul style="list-style-type: none"> <li>1. Facility.</li> <li>2. Direction.</li> </ul>



No.	Trip and Transaction Reports Requirements
	<ul style="list-style-type: none"> <li>3. Trip ID.</li> <li>4. Trip Start Datetime.</li> <li>5. Trip End Datetime.</li> <li>6. Transponder ID.</li> <li>7. Transponder Agency.</li> <li>8. LPN.</li> <li>9. LPJ.</li> <li>10. LPT.</li> <li>11. Toll Rate.</li> <li>12. DWL Violation Flag.</li> <li>13. Trip Confidence.</li> <li>14. Trip Status. <ul style="list-style-type: none"> <li>a. Created.</li> <li>b. Exceptioned: <ul style="list-style-type: none"> <li>i. Split – with reason.</li> <li>ii. Merged – with reason.</li> <li>iii. Write Off – with reason.</li> <li>iv. Other (identified during Design Phase):</li> </ul> </li> <li>c. Posted.</li> <li>d. Reconciled.</li> <li>e. Human Review.</li> <li>f. Mandatory Hold.</li> </ul> </li> <li>15. Trip Status Datetime.</li> <li>16. OD Pair.</li> <li>17. Trip Type.</li> </ul>
	The Historical Transaction and Trip Processing Status Report shall contain historical records for each Transaction and Trip as previously processed.
	Each Transaction and Trip in the Historical Transaction and Trip Processing Status Report shall have one or more records for each status it was assigned during the Trip Building Process.
	The Trip Adjustment Report shall contain information on Trips adjusted by the system or manually by a user.
	<p>This Trip Adjustment Report shall include at a minimum the following fields:</p> <ul style="list-style-type: none"> <li>1. Facility.</li> <li>2. Direction.</li> <li>3. Pre-Adjustment Trip ID.</li> <li>4. Trip Start Datetime.</li> <li>5. Trip End Datetime.</li> <li>6. OD Pair.</li> <li>7. Transponder ID.</li> <li>8. Transponder Agency.</li> </ul>

No.	Trip and Transaction Reports Requirements
	9. LPN. 10. LPJ. 11. LPT. 12. Toll Rate. 13. Trip Type. 14. Adjustment Type. 15. Adjustment Reason. 16. Adjustment Datetime. 17. Adjusted By. 18. Adjustment Field: <ul style="list-style-type: none"> <li>a. Trip ID (for merged or split Trips).</li> <li>b. Transponder ID.</li> <li>c. Transponder Agency.</li> <li>d. License Plate Number.</li> <li>e. License Plate State.</li> <li>f. Toll Rate.</li> <li>g. Trip Type.</li> </ul> 19. Pre-Adjustment Value. 20. Post-Adjustment Value.
	The Trip Adjustment Report shall contain a record for all adjustments made to a Trip.
	The Trip Type Report shall contain summarized information on the distribution of Trips by their respective type as defined in Section 2.2.5.7.1: All Trips for All Facility Types.

#### 2.2.5.15.1.4 Traffic and Travel Time Reports

The purpose of the Traffic and Travel Time Reports is to display the aggregated speed, volume, and travel time data collected by traffic sensors and AVI devices located throughout each Facility.

It's important for the toll system to ensure that the data they use to generate traffic and travel time reports is accurate and reliable. This may involve using multiple data sources and implementing quality control checks to ensure that the data is consistent and free of errors.

The requirements for Traffic and Travel Time reports are as follows:

No.	Traffic and Travel Time Reports Requirements
	The Sensor Speed and Volume Report shall contain the average EL and GP speed (miles/hour) and volume (vehicles per hour per lane) averaged across all reporting gantries by direction and segment for each Facility over a configurable time interval (5 mins, 10 mins, 30 mins, and 60 mins) of the selected day.
	The Sensor Speed and Volume Report shall contain information on EL and GP speed and volume measured by each traffic sensor over a configurable time interval (5 mins, 10 mins, 30 mins, and 60 mins) by direction and Facility for the selected time period.

No.	Traffic and Travel Time Reports Requirements
	The Sensor Speed and Volume Report shall include a filter to exclude anomalous data that falls outside normal ranges.
	<p>The Sensor Speed and Volume Report shall include at a minimum the following fields:</p> <ol style="list-style-type: none"> <li>1. Segments.</li> <li>2. Facility.</li> <li>3. Direction.</li> <li>4. Toll Point.</li> <li>5. Lane.</li> <li>6. Device ID.</li> <li>7. Speed (EL &amp; GP).</li> <li>8. Volume (EL &amp; GP).</li> <li>9. Traffic Start Datetime.</li> <li>10. Traffic End Datetime.</li> </ol>
	The Travel Time Report shall contain the average time it takes for a vehicle to traverse a Facility via the EL versus the GP lanes as determined by the Travel Time AVI Scans averaged over user configurable time increments.
	The Travel Time Site AVI Detail Report shall contain information on the Transponder reads detected at Travel Time Sites.
	<p>The Travel Time Site AVI Detail Report shall include the following fields:</p> <ol style="list-style-type: none"> <li>1. Facility.</li> <li>2. Direction.</li> <li>3. Travel Time Site.</li> <li>4. Antenna ID.</li> <li>5. Transponder ID.</li> <li>6. Transponder Agency.</li> <li>7. Detection Time.</li> </ol>
	The Traffic Incident Report shall contain traffic incidents logged from TOCS.
	<p>The Traffic Incident Report shall include at a minimum the following fields:</p> <ol style="list-style-type: none"> <li>1. ID (auto generated unique ID for incident log).</li> <li>2. Start Datetime.</li> <li>3. End Datetime.</li> <li>4. Type.</li> <li>5. Screenshots.</li> <li>6. Facility.</li> <li>7. Direction.</li> <li>8. Toll Point or nearby Toll Point.</li> <li>9. Mile marker.</li> <li>10. Cross street.</li> <li>11. Geocoordinates.</li> <li>12. Details/Notes.</li> </ol>

No.	Traffic and Travel Time Reports Requirements
	13. Last updated Datetime.

#### 2.2.5.15.1.5 Congestion Pricing System Reports

The purpose of the Congestion Pricing System Reports is to provide real-time and historical information on all scheduled rates, whether published in production or in the Parallel CPS Test Environment. This category of reports is utilized by the TOC to confirm that rates displayed in the TOCS and on the TRDMS match the expected rates. These reports are also used by SRTA staff to determine if the current rates need to be modified.

The requirements for Congestion Pricing System reports are as follows:

No.	Congestion Pricing System Reports Requirements
	The Toll Rate Report shall contain information on historical posted toll rates, including the most recent posted toll rates by Facility, direction, and OD Pair over a configurable time interval.
	The Toll Rate Report shall also include the published rates or alphanumeric messages posted from an override.
	The Congestion Pricing Calculation Report shall contain information on the intermediate calculations used to generate a dynamic toll rate for both production and Parallel CPS Test Environment dynamic rate plans.
	The Parallel CPS Test Environment Toll Rate Report shall output the calculated rates from the Parallel CPS Test Environment.
	The TRDMS Publish Report shall contain the rates or messages sent to each TRDMS, the time each rate or message was sent, the TRDMS location and ID, and the confirmation of what was actually posted on the sign when the rate or message was sent.
	The Rate Plan History Report shall contain historical information on the rate plans in effect throughout the duration of the Project including all associated rate plan parameters, user approvals, schedule details, etc.
	The Autogenerated Failover Rate Plan Report shall contain the historical and current failover rate plan values automatically generated by the CPS.

#### 2.2.5.15.1.6 Configuration Reports

The purpose of the Configuration Reports is to provide a record of all SRTA configurable parameters, and any modifications made to those parameters by authorized SRTA or TISC users.

The requirements for Configuration reports are as follows:

No.	Configuration Reports Requirements
	The Configuration System Parameters Setting History Report shall contain historical parameter assignments for the Configurable System Parameters Settings to identify what the configuration settings were at any given effective datetime.
	The Configurable System Parameters Setting History Report shall include the following fields:

No.	Configuration Reports Requirements
	<ol style="list-style-type: none"> <li>1. A unique record ID.</li> <li>2. The datetime the setting was placed into effect.</li> <li>3. The user that put that placed the setting into effect.</li> <li>4. The previous value of the parameter.</li> <li>5. The modified value (if applicable) of the parameter.</li> </ol>

#### 2.2.5.15.1.7 MOMS Reports

The reports and dashboards contained within the MOMS will be used by TISC maintenance personnel and SRTA staff to monitor and maintain the ETCS. The MOMS reports will provide a record of all maintenance services provided by the TISC, an accurate and up-to-date inventory of all ETCS equipment, and historical reports to show maintenance performance trends.

The requirements for the MOMS reports are as follows:

No.	MOMS Reports Requirements
	The Inventory Detail Report shall list all SRTA owned assets installed in the ETCS system and all SRTA owned spare parts not installed on the system.
	<p>The Inventory Detail Report shall include at a minimum the following fields:</p> <ol style="list-style-type: none"> <li>1. Facility/Warehouse Name.</li> <li>2. Direction.</li> <li>3. Lane.</li> <li>4. Site.</li> <li>5. Mile Marker (if applicable).</li> <li>6. Geocoordinates (if applicable).</li> <li>7. Asset Name.</li> <li>8. Asset Type.</li> <li>9. Asset Description.</li> <li>10. Asset Tag (assigned barcode or other machine-readable number).</li> <li>11. Asset Serial Number.</li> <li>12. Software Version (if applicable).</li> <li>13. Model Name.</li> <li>14. Asset Manufacturer.</li> <li>15. Acquisition Cost.</li> <li>16. Warranty Expiration.</li> <li>17. Installation Status: <ol style="list-style-type: none"> <li>a. Created.</li> <li>b. Installed.</li> <li>c. Failed/Broken.</li> <li>d. Returned to Vendor/Returned Merchandise Authorization (RMA).</li> <li>e. Warehoused (not installed in the field).</li> </ol> </li> <li>18. Install Datetime.</li> </ol>

No.	MOMS Reports Requirements
	19. Last Installation Datetime. 20. Out of Service Reason. 21. Replaced By. 22. Replacement Cost. 23. Replacement Vendor.
	The Inventory Summary Report shall provide a Summary of all SRTA owned inventory deployed in the ETCS.
	The Inventory Summary Report shall include at a minimum the following fields: 1. Facility/Warehouse Name. 2. Asset Name. 3. Asset Type. 4. Asset Description. 5. Location. 6. Installation Status: a. Installed. b. Failed/Broken. c. Returned to Vendor/Returned Merchandise Authorization (RMA). d. Warehoused (not installed in the field). 7. Asset Quantity.
	The Inventory Movement History Report shall generate a report listing all inventory Asset movements tracked within the system.
	The Inventory History Report shall include at a minimum the following fields: 1. Movement Datetime. 2. Associated Work Order ID. 3. Asset Name. 4. Asset Type. 5. Asset Description. 6. Asset Tag (assigned barcode or other machine-readable number). 7. Asset Serial Number. 8. Quantity. 9. Movement Type: a. Warehouse to Installation. b. Installation to Warehouse. c. Warehouse to RMA. d. Warehouse to Disposal. 10. Origin Location/Status. 11. Destination Location/Status. 12. Moved By.
	The Inventory Cost Summary Report shall provide a summary of the cost of all Assets contained in the inventory.

No.	MOMS Reports Requirements
	<p>The Inventory Cost Summary Report shall include at a minimum the following fields:</p> <ol style="list-style-type: none"> <li>1. Asset Name.</li> <li>2. Asset Type.</li> <li>3. Asset Description.</li> <li>4. Installation Status.</li> <li>5. Quantity.</li> <li>6. Unit Cost.</li> <li>7. Total Cost by Asset.</li> <li>8. Total cost for all Assets in inventory.</li> </ol>
	<p>The ETCS Work Order Detail Report shall provide detail for all MOMS generated Work Orders between selected start and end datetimes.</p>
	<p>The ETCS Work Order Detail Report shall include at a minimum the following fields:</p> <ol style="list-style-type: none"> <li>1. Work Order ID.</li> <li>2. Facility/Warehouse Name.</li> <li>3. Direction.</li> <li>4. Lane.</li> <li>5. Site.</li> <li>6. Mile Marker.</li> <li>7. Asset Name.</li> <li>8. Asset Type.</li> <li>9. Asset Location.</li> <li>10. Asset Tag (assigned barcode or other machine-readable number).</li> <li>11. Asset Serial Number.</li> <li>12. Software Version (if applicable).</li> <li>13. Failure Code.</li> <li>14. Failure Description.</li> <li>15. System(s) Impacted by Failure.</li> <li>16. Assigned Priority Level.</li> <li>17. Work Order Creator.</li> <li>18. MOMS Maintenance Type (Corrective/Preventative).</li> <li>19. Assigned Technician.</li> <li>20. Datetime of Failure.</li> <li>21. Datetime of Acknowledgement.</li> <li>22. Escalation Time (if applicable).</li> <li>23. Datetime of Repair.</li> <li>24. Calculated Time to Acknowledge.</li> <li>25. Acknowledge Time Breached SLA Requirement (Y/N).</li> <li>26. Calculated Time to complete Final Repair.</li> <li>27. Repair Time Breached SLA Requirement (Y/N).</li> </ol>

No.	MOMS Reports Requirements
	28. Stop Clock Implemented (Y/N) (Stop Clock Conditions are defined in Appendix E: Service Level Agreements (SLAs)). 29. Stop Clock Start Datetime. 30. Stop Clock End Datetime. 31. Stop Clock Reason. 32. Calculated Duration of Stop Clock. 33. Duration of WO (including Acknowledge, Escalation, Repair, and Stop Clock Times). 34. Summary of Repair Activities. 35. Change Request Form (CRF) ID, if applicable.
	The Preventative Maintenance Tasks and Activity Report shall list, and report all scheduled preventative maintenance activities the TISC will be performing.
	The Preventative Maintenance Activity Report shall include at a minimum the following fields: 1. Facility. 2. Direction. 3. Lane. 4. Site. 5. Mile Marker. 6. Preventative Maintenance Task Description. 7. Scheduled occurrence. 8. Work Order ID. 9. Assigned Technician. 10. Datetime of Acknowledgement. 11. Datetime of PM Task completion. 12. Results of PM (observations). 13. Days Late (If the PM Work Order is past due).
	The Zone Controller Availability Report shall provide the availability of each Zone Controller.
	The DVAS Camera Availability Report shall provide the availability of each DVAS camera.
	The Toll Facility Host Availability Report shall provide the availability of the individual TFH applications.
	The Roadside Network Availability Report shall provide the availability of the Roadside Network switches.
	The Hub Internet Connectivity Availability Report shall provide the availability of internet connectivity to all hub locations.
	The Traffic Sensor Availability Report shall provide the availability of all Traffic Sensor devices.
	The TRDMS Availability Report shall provide the availability of all TRDMS signs.
	The TRDMS CCTV Camera Availability Report shall provide the availability of all Toll Rate CCTV cameras.
	Availability reports shall include at a minimum the following fields: 1. Facility.



No.	MOMS Reports Requirements
	<ol style="list-style-type: none"> <li>2. Start Datetime.</li> <li>3. End Datetime.</li> <li>4. Total Available Time.</li> <li>5. Downtime during the report search period.</li> <li>6. Percentage Uptime.</li> <li>7. Name of the Asset whose availability was measured.</li> </ol>
	Availability reports shall report on downtime according to the level specified in Appendix E: Service Level Agreements (SLAs) (e.g., per unit or averaged across all units).
	The AVI Read and Correlation Accuracy Report shall provide a summary of the number of missed reads and miscorrelations of Transponders at each Lane per Facility. See SLA Lane Image Correlation for more information on the data included in this report.
	The Image Correlation Accuracy Report shall provide a summary of the number of miscorrelations of images at each Lane per Facility.
	The Image Capture/Readability Accuracy Report shall provide a summary of the number of images that are captured and readable either manually or automatically.
	The Trip Building Accuracy Report shall provide a summary of the number of Transactions that were assembled and not assembled into Trips per Facility, Direction, and Toll Point.
	The Trip Toll Rate Assignment Accuracy Report shall compare the toll rate assigned to a Trip with the toll rate in effect as determined by the CPS.
	The TRDMS Messaging Accuracy Report shall compare the toll rates in effect as determined by the CPS or rate tables in effect for the audit period with the toll rate as displayed by the TRDMS for matching origin-destination pair and time intervals.
	The Trip Building Time Report shall identify the average time between the latest Transaction creation datetime in a Trip and when the Trip was available for transmission to the CBO, including any hold time between the two events.
	The TRDMS Messaging Time Report shall compare the toll rate publication time as determined by the CPS with the time the sign confirmed its displayed message matched that of the published toll rate.
	The Image Processing Time Report shall measure the time between the creation of a Transaction with an image set requiring review and the time the review of the image set is complete and the results are available for use in the Trip Building System.
	The Automated Alert Notification Time Report shall measure the duration between the time a defined event (per Section 2.2.5.20.1: SRTA Defined Alerts) occurs and the time its corresponding alert notification is sent to all configured recipients.
	The Trip Posting Time Report shall measure the time the Trip is built and available to post to the CBO and the time it was posted to the CBO, exclusive of any SRTA-specified hold time or time spent in manual review per Section 2.2.5.7: Trip Building System.
	The Trend Analysis Report shall show maintenance metrics from all assets in the ETCS.
	<p>The Trend Analysis Report shall contain at a minimum the following fields:</p> <ol style="list-style-type: none"> <li>1. Facility.</li> </ol>

No.	MOMS Reports Requirements
	<ol style="list-style-type: none"> <li>2. Direction.</li> <li>3. Toll Point.</li> <li>4. Lane.</li> <li>5. Asset Name.</li> <li>6. Asset Description.</li> <li>7. Asset Type.</li> <li>8. Mean time between failures (MTBF) Month-to-Date (MTD).</li> <li>9. MTBF Year-to-Date (YTD).</li> <li>10. MTBF Month over Month (MoM).</li> <li>11. MTBF Year over Year (YoY).</li> <li>12. Mean Time to Repair (MTTR) MTD.</li> <li>13. MTTR YTD (Response and Repair).</li> <li>14. MTTR MoM (Response and Repair).</li> <li>15. MTTR YoY (Response and Repair).</li> <li>16. Mean Time To Failure (MTTF, for unrepairable parts if any) MTD.</li> <li>17. MTTF YTD.</li> <li>18. MTTF MoM.</li> <li>19. MTTF YoY.</li> </ol>
	<p>The Lane Performance Report shall provide a detailed breakdown of subsystem performance at all lanes.</p>
	<p>The Lane Performance Report shall contain at a minimum the following fields:</p> <ol style="list-style-type: none"> <li>1. Facility.</li> <li>2. Segment.</li> <li>3. Direction.</li> <li>4. Lane.</li> <li>5. Start Datetime.</li> <li>6. End Datetime.</li> <li>7. Average Speed.</li> <li>8. Transaction Count: <ol style="list-style-type: none"> <li>a. AVI.</li> <li>b. Plate.</li> <li>c. Other (determined during Design Phase).</li> </ol> </li> <li>9. Average AVI Polls for the following tag types: <ol style="list-style-type: none"> <li>a. SeGo.</li> <li>b. 6C.</li> <li>c. TDM.</li> </ol> </li> <li>10. Average ALPR Confidence.</li> <li>11. Count of images with no ALPR result.</li> </ol>

The requirements for TFH Events and Alerts Reports are as follows:

No.	TFH Events and Alerts Reports Requirements
	The TFH Events and Alerts Report shall contain a list of all defined alert notifications sent to configured recipients.
	The TFH Events and Alerts Report shall include the following fields: <ol style="list-style-type: none"> <li>1. Alert Code.</li> <li>2. Alert Description.</li> <li>3. Alert Creation Datetime.</li> <li>4. Event Type.</li> <li>5. Notification Sent Datetime.</li> </ol>

#### 2.2.5.15.2 SRTA Defined Dashboards

The requirements for SRTA defined dashboards, are as follows:

No.	SRTA Defined Dashboards Requirements
	The SRTA defined dashboards shall be available to SRTA at the start of the first TFH Revenue Ready Test.
	The SRTA defined dashboards shall employ a standardized dashboard format with headers and footers on all screens that contain the following: <ol style="list-style-type: none"> <li>1. SRTA logo.</li> <li>2. Dashboard Title.</li> <li>3. Datetime the dashboard was generated or updated/refreshed.</li> <li>4. Selection Criteria used to generate the dashboard.</li> <li>5. Username of the user logged in to view the dashboard.</li> </ol>
	All charts and graphs contained within SRTA defined dashboards shall include a legend.
	All SRTA defined dashboards shall be capable of displaying data point labels (the text values displayed beside bars, lines, points, etc.) on charts and graphs.
	All charts and graphs contained within SRTA defined dashboards shall display column, row, and axis titles.
	The SRTA defined dashboards shall be fully reconcilable with the related SRTA defined reports.
	The format and content of each dashboard shall be approved during the Reports Design and Development Process.

#### 2.2.5.15.2.1 IPS Performance Dashboard

The requirements for the IPS Dashboard are as follows:

No.	IPS Performance Dashboard Requirements
	The IPS Performance Dashboard shall provide accurate data on the Image Processing System progress and performance.

No.	IPS Performance Dashboard Requirements
	<p>The IPS Performance Dashboard shall contain the following information:</p> <ol style="list-style-type: none"> <li>1. Total number of images automatically reviewed and manually reviewed by Facility and direction.</li> <li>2. Total number of images waiting for review by Facility and direction.</li> <li>3. Datetime of oldest image waiting for review by Facility and direction.</li> <li>4. Code-off image counts by code-off reason by Facility and direction.</li> </ol>
	The IPS Performance Dashboard shall be filterable by a configurable time period that includes exact datetimes and relative dates such as last eight (8) days, month, and/or year.
	<p>The IPS Performance Dashboard shall be filterable by, but not limited to:</p> <ol style="list-style-type: none"> <li>1. Facility.</li> <li>2. Start Datetime.</li> <li>3. End Datetime.</li> <li>4. Direction.</li> </ol>
	The IPS Performance Dashboard start and end datetime filter criteria shall be applied to the datetime of the Transaction associated with the images reviewed or waiting to be reviewed.

#### 2.2.5.15.2.2 IPS Audit Dashboard

The requirements for the IPS Audit Dashboard are as follows:

No.	IPS Audit Dashboard Requirements
	The IPS Audit Dashboard shall provide accurate data on the Image Audit System progress and performance.
	<p>The IPS Audit Dashboard shall contain the following information:</p> <ol style="list-style-type: none"> <li>1. Total number of images reviewed by Image Auditor.</li> <li>2. Total number of images in audit backlog by Image Auditor.</li> <li>3. Count of Pass, Fail, and Skip from image audits by Facility.</li> <li>4. Percent accuracy result from image audits by Facility.</li> </ol>
	The IPS Audit Dashboard shall be filterable by a configurable time period that includes exact datetimes and relative dates such as last eight (8) days, month, and/or year.
	<p>The IPS Audit Dashboard shall be filterable by:</p> <ol style="list-style-type: none"> <li>1. Facility.</li> <li>2. Direction.</li> <li>3. Toll Point.</li> <li>4. Lane.</li> <li>5. Image Auditor.</li> <li>6. Start Datetime.</li> <li>7. End Datetime.</li> </ol>
	The IPS Audit Dashboard start and end datetime filter criteria shall be applied to the datetime of the Transaction associated with the image audited.

#### 2.2.5.15.2.3 Trip Building Dashboard

The requirements for the Trip Building Dashboard are as follows:

No.	Trip Building Dashboard Requirements
	The Trip Building Dashboard shall provide accurate and reconcilable counts of Trips created by the ETCS.
	The Trip Building Dashboard shall contain the following information: <ol style="list-style-type: none"><li>1. Count of total Transactions processed.</li><li>2. Count of exceptioned Transactions.</li><li>3. Count of Trips created.</li><li>4. Count of Trips by OD Pair.</li><li>5. Count of Trips by Trip Type.</li><li>6. Count of Trips by Transponder Agency.</li><li>7. Count of Trips in each status.</li><li>8. Count of Trips by Facility.</li><li>9. Count of Trips by direction.</li></ol>
	The Trip Building Dashboard shall be filterable by a configurable time period that includes exact datetimes and relative dates such as last eight (8) days, month, and/or year.
	The Trip Building Dashboard shall be filterable by, but not limited to: <ol style="list-style-type: none"><li>1. Facility.</li><li>2. Direction.</li><li>3. OD Pair.</li><li>4. Trip Type.</li><li>5. Trip Status.</li></ol>
	Trip counts shall be displayed in a graphical format such as in a time series chart or bar chart.

#### 2.2.5.15.2.4 CPS Dashboard

The requirements for the CPS Dashboard are as follows:

No.	CPS Dashboard Requirements
	The CPS Dashboard shall allow users the ability to monitor the current OD pair rates, pricing segment rate calculations, traffic data alerts, and effective rate plans in real-time.
	The CPS Dashboard shall allow SRTA to view the near real-time data collected from the roadside equipment that feeds into the Congestion Pricing Algorithm.
	This TISC shall work with SRTA to create a custom CPS dashboard that includes graph displays of different types and can display current and historical rate information with drill down capabilities.
	The CPS Dashboard shall display the rates published to the TRDMS and the corresponding rate plan in effect for each Facility.

No.	CPS Dashboard Requirements
	Authorized users shall have the ability to drill-down into each TRDMS' data field to view the toll rates published to the sign since the beginning of the current day.
	The Parallel CPS Test Environment shall be accessible through the CPS Dashboard to utilize its full functionality.

#### 2.2.5.15.2.5 ETCS System Health Dashboard

The ETCS System Health Dashboard will provide a high-level overview of the operational status of all ETCS equipment, communications, and workstations, allowing TISC and SRTA maintenance personnel to quickly identify degradation or failures throughout the EL network and coordinate and perform the necessary repairs.

The requirements for the ETCS System Health Dashboard are as follows:

No.	ETCS System Health Dashboard Requirements
	The TFH shall provide an ETCS System Health Dashboard that communicates near real-time ETCS operational status and overall health.
	The ETCS System Health Dashboard shall display a schematic map per Facility with the ability to switch between Facility views and open multiple facility views simultaneously.
	The schematic map shall display the location of all Toll Point, TRDMS, CCTV Cameras, AVI Travel Time Sensors, Traffic Sensors, Alternate Power sources, WAN and LAN Switches, and Hub Building sites. The schematic map shall be a color-coded schematic map of the facilities with the current state of the equipment along the facilities indicated by the displayed colors.
	The ETCS System Health Dashboard shall provide pop up displays triggered by mouse when hovered over the parent component that show subcomponent status and work order information.
	The sites displayed in the ETCS System Health Dashboard shall be color-coded based on the operational status of the site.
	The ETCS System Health Dashboard shall enable users to drill down to the operational status of the individual equipment, applications, systems, and services at each site.
	<p>The ETCS System Health Dashboard shall contain the following information:</p> <ol style="list-style-type: none"> <li>1. Operational status of all Toll Point applications.</li> <li>2. Operational status of the TFH system and applications.</li> <li>3. Operational status (operational or degraded) and open Work Order details for the following equipment, applications, and systems: <ol style="list-style-type: none"> <li>a. Toll Points and Corresponding Subsystems and Applications.</li> <li>b. TRDMS.</li> <li>c. CCTV Cameras.</li> <li>d. Travel Time Sites.</li> <li>e. Traffic Sensor Sites.</li> <li>f. Alternate Power Sites.</li> <li>g. Network Switches.</li> </ol> </li> </ol>

No.	ETCS System Health Dashboard Requirements
	h. Cabinets and Hub Buildings (e.g. temperature, humidity, and access sensors).

#### 2.2.5.16 End-to-End Audit System

SRTA requires the TFH to include audit tools to assess the performance of the System accurately and efficiently. The tools provided by the TISC should allow SRTA users to disposition and verify TISC reported Transaction processing, performance measurements, and failures.

An end-to-end system audit is a comprehensive review of a system from start to finish, including all of its components and the processes and controls that are in place. The goal of an end-to-end system audit is to ensure that the system is functioning as intended, is meeting all relevant requirements, and is operating in a secure and efficient manner.

During an end-to-end system audit, the auditor will review the system's design and architecture, its controls and processes, and its implementation and maintenance. The auditor may also assess the system's security and risk management practices, as well as its compliance with relevant laws, regulations, and industry standards.

To perform an end-to-end system audit, the auditor will typically review documentation, observe system processes, and test system controls. The auditor may also interview relevant personnel and gather other relevant information as needed. Once the audit is complete, the auditor will provide a report detailing any issues or concerns that were identified and may recommend corrective actions to address those issues.

The End-to-End Audit System is intended to allow SRTA to disposition a Transaction from the roadside to the Trip level at any moment during Transaction and Trip processing. The system should allow users to clearly identify the processes the Transactions have passed through. When a user uses the End-to-End Audit System to search for a Trip, it should display all related Transactions or Trips. A related Transaction is any Transaction that made up the Trip. A related Trip is any Trip that was created via a split of or archived due to a merge into the searched for Trip.

The requirements for the End-to-End Audit System are as follows:

No.	End-to-End Audit System Requirements
	The End-to-End Audit System shall allow users to search by Transaction or Trip ID.
	The End-to-End Audit System shall retrieve and display an up-to-date list of related Transactions and related Trip information as a search result.
	If a searched for Transaction has yet to be formed into a Trip, no Trip information shall be returned.
	For related Transactions within a Trip, the End-to-End Audit System shall provide the following information for each Transaction: <ol style="list-style-type: none"> <li>1. Transaction ID.</li> <li>2. Toll Point.</li> <li>3. Datetime of Transaction.</li> <li>4. Transponder number(s).</li> <li>5. Transponder agency(s).</li> </ol>

No.	End-to-End Audit System Requirements
	<ul style="list-style-type: none"> <li>6. Vehicle classification</li> <li>7. Final/current plate result.</li> <li>8. Final/current plate state.</li> <li>9. Trip ID.</li> <li>10. Toll Rate.</li> </ul>
	<p>For related Trips when searching for a Trip, the End-to-End Audit System shall provide the following information:</p> <ul style="list-style-type: none"> <li>1. Trip ID.</li> <li>2. OD pair.</li> <li>3. Entry datetime of the Trip.</li> <li>4. Exit datetime of the Trip.</li> <li>5. Trip Type.</li> <li>6. Transponder ID.</li> <li>7. Transponder Agency.</li> <li>8. Final LPN.</li> <li>9. Final LPJ.</li> <li>10. Final LPT.</li> <li>11. Toll Rate.</li> <li>12. Trip status (Reference Section 2.2.5.7: Trip Building System).</li> </ul>
	<p>The End-to-End Audit System shall allow users to select a Transaction from the related Transactions list to show greater detail of that Transaction.</p>
	<p>The Transaction detail in the End-to-End Audit System shall include the following information, as applicable in each phase of the Transaction status:</p> <ul style="list-style-type: none"> <li>1. Datetime of Transaction.</li> <li>2. Transaction Status: <ul style="list-style-type: none"> <li>a. Received from roadway.</li> <li>b. Waiting for plate result.</li> <li>c. Ready for Trip building.</li> <li>d. Trip mandatory delay.</li> <li>e. Trip ready for human review.</li> <li>f. Posted status.</li> <li>g. Excepted.</li> </ul> </li> <li>3. Transponder ID.</li> <li>4. Transponder Agency.</li> <li>5. Transponder Status.</li> <li>6. Transponder Protocol.</li> <li>7. AVI Poll Count.</li> <li>8. Final LPN (if available).</li> <li>9. Final LPJ (if available).</li> <li>10. Final LPT (if available).</li> </ul>



No.	End-to-End Audit System Requirements
	11. Vehicle Classification. 12. Thumbnails of images along with camera numbers with links to images. 13. Detailed image review history to show how the final plate value was determined.
	The End-to-End Audit System shall allow authorized users to save the search results in a csv, excel, and/or pdf format.

#### 2.2.5.17 Vehicle List

SRTA requires a Vehicle List functionality where authorized users can create lists of vehicles for customized processing. The three processing results are notification, exceptioning, and Trip hold. The Notification List is intended to have the TFH alert designated users if a specific vehicle travels through SRTA's ELs (e.g., test vehicles, amber alerts, etc.). The Exceptions List is intended to reduce Transaction processing for known vehicles that may create abnormal traffic behaviors (e.g., HERO vehicles, buses, maintenance vehicles, etc.). The Trip Hold List is intended to hold Trips made by known vehicles that require a human to review before posting to CBO (e.g., test vehicles, vehicle with plate or transponder that is causing a known issue, etc.).

The general requirements for the vehicle lists are as follows:

No.	Overall Vehicle List Requirements
	The TFH shall support vehicle list creation.
	The TFH shall support vehicle list maintenance.
	The TFH shall support vehicle list removal (where removal means disable, not deletion).
	The TFH shall support three (3) different list types: <ol style="list-style-type: none"> <li>1. Notification List.</li> <li>2. Exceptions List.</li> <li>3. Trip Hold List.</li> </ol>
	The TFH shall enable authorized users to add and remove license plate and/or transponder information to/from each of the vehicle list types.
	The TFH shall enable authorized users to manage (edit) the Notification, Exception, and Trip Hold lists.
	The TFH shall allow authorized users to create custom labels for each list type (e.g., AMBER List, Silver List, etc.).
	The TFH shall allow authorized users to remove labels for each list type.
	The TFH shall allow authorized users to assign vehicles a label within each list type.
	The TFH shall allow users to upload lists of license plates and transponders in a CSV or similar format.
	The TFH shall automatically detect duplicate plate or transponders within a list and prevent the duplicate entry from being created.

No.	Overall Vehicle List Requirements
	The ability to manage (edit) vehicle lists shall be controlled by user and role attributes based on the User Access Level Matrix described in Section 2.2.5.1: TFH Connectivity and User Access.
	The TFH shall transfer lists to roadside equipment within fifteen minutes of update for those lists needed at the roadside to meet the alerting requirements.

#### 2.2.5.17.1 Notification List Requirements

The requirements for the Notification List are as follows:

No.	Notification List Requirements
	If the toll point notifies the TFH of detection of a vehicle that is on the Notification List, by transponder, the TFH shall send out an alert notification.
	If the TFH identifies a transaction for a vehicle that is on the Notification List, either by transponder or plate, the TFH shall send out an alert notification.
	The alert notification shall contain appropriate license plate and/or transponder information, label, the datetime of the event and detailed location information (e.g., Facility, Direction, Toll Point).

#### 2.2.5.17.2 Exceptions List Requirements

The requirements for the Exceptions List are as follows:

No.	Exceptions List Requirements
	If the TFH system detects a vehicle that is on the Exceptions List, either by transponder or by plate, the TFH system shall not form Transactions from those vehicles into Trips.
	The TFH system shall mark Transactions from vehicles on the Exception List with an exceptioned status in the related reports to indicate the Transaction was included on the Exceptions List.
	The TFH shall verify whether a Transaction was made by a vehicle with a transponder on the Exceptions List prior to sending it to the IPS for image review.
	Transactions for vehicles on the Exceptions List shall be routed to exceptions processing for further disposition.

#### 2.2.5.17.3 Trip Hold List Requirements

The requirements for the Trip Hold List are as follows:

No.	Trip Hold List Requirements
	If the TFH system detects a vehicle that is in the Trip Hold List, either by transponder or by plate, the TFH system shall mark the vehicle's Trips with a Manual Hold status in the Trip Building System.

No.	Trip Hold List Requirements
	The TFH system shall retain all Trips on the Trip Hold List until an authorized user manually reviews and posts the Trip.
	Trips held based on the Trip Hold list shall be clearly distinguishable in the Trip GUI via a flag or their Manual Hold status.

#### 2.2.5.18 Toll Operation Center System (TOCS)

The TISC is required to provide a “one stop shop”, otherwise known as Toll Operation Center System (TOCS) user interface, for the SRTA TOC Operators to monitor and operate the EL efficiently and accurately. The objective of TOCS is to reduce the number of different applications/interfaces required to be used by SRTA TOC Operators. The requirements for the TOCS are as follows:

No.	Toll Operation Center System (TOCS) Requirements
	The TOCS shall Interface with the different modules within the TFH to obtain current and historical toll rates, equipment status, and traffic data.
	The TOCS shall include a user interface that provides the real-time status of the operating conditions of each Facility.
	During the Design Phase, the TISC shall coordinate with SRTA on how to display all necessary information for each Facility.
	All data within the TOCS shall be reconcilable between all data displays in the TOCS.
	<p>The TOC operators shall use the TOCS and the TISC provided workstations to perform actions including:</p> <ol style="list-style-type: none"> <li>1. View, respond to, and resolve alarms.</li> <li>2. Manage events (Open tickets, review tickets, verify equipment failures).</li> <li>3. Make updates to the CPS.</li> <li>4. Set toll rates.</li> <li>5. Post messages to the TRDMS.</li> <li>6. Run reports.</li> <li>7. View camera live feed/recording (e.g., TRDMS).</li> <li>8. Use the Toll Operation Center Application.</li> <li>9. Reverse I-75A and I-75B.</li> <li>10. Log incidents.</li> <li>11. Receive and send emails.</li> <li>12. Visit whitelisted websites.</li> </ol>
	<b>Schematic Map</b>
	The TOCS GUI shall contain a schematic map of each facility.
	The TOCS GUI shall allow users to toggle between schematic map of each facility and have multiple instances open simultaneously.
	The schematic map in the TOCS shall display the names of that Facility’s major cross streets.

No.	Toll Operation Center System (TOCS) Requirements
	The individual schematic maps in the TOCS shall enable users to visualize real time traffic conditions on EL and GP lanes via data gathered from field devices by Facility and by direction for each pricing segment.
	The pricing segments in each schematic map shall be color-coded to reflect the current traffic conditions (e.g., red indicates traffic speeds under 25 mph, yellow indicates traffic speeds between 25 mph and 45 mph, and green indicates traffic speeds over 45 mph).
	The color-coded ranges for the pricing segments in the schematic maps shall be individually configurable by users.
	The schematic map shall allow users to view traffic data in detail if a Pricing segment is clicked such as the numeric values of the traffic conditions (e.g., speed, volume, and/or density) averaged by Pricing Segment for past hour.
	The individual schematic maps in the TOCS shall display the TRDMS' configured in each Facility, including the static/dynamic destinations and current displayed toll rates/messages.
	The schematic map shall display if failover or other non-scheduled rates are in effect.
	The schematic map shall alert the user visually if a failover or other non-scheduled rate was implemented.
	The schematic map shall display rates for the previous hour for each OD pair.
	<b>Roadway Reversibility.</b>
	The TOCS shall allow users to monitor the reversals for I-75A and I-75B facilities.
	The TOCS shall allow authorized users to conduct manual reversals for I-75A and I-75B facilities.
	For the reversible facilities, the TOCS shall display the current direction of travel or close/open for each access point and Facility.
	For the reversible facilities, the TOCS shall allow authorized users to change the direction of travel or change between close/open status at reversible Toll Points.
	For the reversible facilities, the TOCS shall allow authorized users to change the direction of travel or lanes status for a TRDMS such that correct messages (closed message, toll rates or destination and toll rates) appear on the TRDMS.
	For the reversible facilities, the TOCS shall allow users to view the messages being sent to and from the GDOT ATMS.
	The TOCS shall log and display every user reversal action (e.g., who reversed a TP or a TRDMS).
	The TOCS shall alert and display WWV alerts as described in Section 2.2.5.11: Roadway Reversal Functionality.
	The TOCS shall alert and display WWV alerts on the respective schematic map with visual and audio alarm indicating which TP the WWV occurred on. (e.g. flashing red dot on the TP).
	<b>Traffic Incident Logging</b>
	<p>The TOCS shall allow the TOC Operators to log traffic incidents with the following fields and allowable values to be defined during the design phase:</p> <ol style="list-style-type: none"> <li>1. ID (auto generated unique ID for incident log).</li> </ol>

No.	Toll Operation Center System (TOCS) Requirements
	<ul style="list-style-type: none"> <li>2. Start and End Datetime (required).</li> <li>3. Type.</li> <li>4. Camera ID.</li> <li>5. Facility.</li> <li>6. Direction.</li> <li>7. Toll Point or nearby Toll Point.</li> <li>8. Mile marker.</li> <li>9. Cross street.</li> <li>10. Geocoordinates.</li> <li>11. Details/Notes.</li> <li>12. Last updated Datetime.</li> <li>13. Attachments (e.g., screenshot files).</li> </ul>
	The TOCS shall allow authorized users to search and view EL incident logs created through the TOCS.
	The TOCS shall allow authorized users to only modify EL incident logs entries that have no end datetime specified.
	Incidents shall be closed and non-modifiable when an end datetime is provided for the incident in the Incident Log.
	The TOCS shall allow authorized users to export one or multiple EL incident search results as PDF, CSV, and Excel formats to the user's desktop or other location.
	<b>Sign Messaging Requirements</b>
	The TOCS shall allow authorized users to manually post messages to a sign or a group of signs by entering a message via the TOCS GUI.
	The TOCS shall allow users to manually post messages, i.e., output an Alphanumeric Manual Override to a sign or a group of signs by selecting from a list of available standard messages (HOV 3+, CLOSED, OPEN TO ALL, or other messages discussed during design phase of the Project).
	The TOCS shall allow users to implement Alphanumeric Manual Overrides with start and end time.
	The TOCS shall allow users to implement Alphanumeric Manual Overrides without an end date.
	The TOCS shall allow users to stop an Alphanumeric Manual Override at any time, using a button.
	An Alphanumeric Manual Override message shall remain in effect for the duration set by the user, unless the stop button is utilized by an authorized user.
	If an Alphanumeric Manual Override is output, the message posted to the sign shall also be recorded for use in the reporting system.
	Alphanumeric Manual Overrides shall only be used to display messages on a sign.
	The displayed Alphanumeric Manual Override shall not override the underlying rate plan currently in effect.

No.	Toll Operation Center System (TOCS) Requirements
	MOMS Interface Requirements
	<p>The TOCS shall Interface with the MOMS to display operational status of the following equipment:</p> <ol style="list-style-type: none"> <li>1. Toll Point. <ol style="list-style-type: none"> <li>a. Zone Controller.</li> <li>b. VTS cameras.</li> <li>c. AVC system.</li> <li>d. AVI system.</li> </ol> </li> <li>2. TRDMS.</li> <li>3. CCTV.</li> <li>4. DVAS.</li> <li>5. Traffic Sensors.</li> <li>6. Permanent generators.</li> <li>7. Travel Time sites.</li> <li>8. Hubs, switches &amp; ports.</li> </ol>
	The TOCS shall allow a TOC operator to select equipment on the TOC interface, enter basic information and request a maintenance ticket to be opened (e.g., CCTV viewing issue, system issues) without requiring the user to open a MOMS ticket request screen.
	The logging interface shall be integrated with the MOMs to allow the TOC Operator to view status and trace a request from the initial submission through the resolution of the request.

#### 2.2.5.19 Maintenance Online Management System

The TISC is required to provide a Maintenance Online Management System (MOMS) application that allows for the automated monitoring of roadside and host systems equipment and applications, the automated or manual generation of Work Orders, the automated tracking and reporting of Work Orders, the creation and handling of alerts and notifications, and the management and reporting of equipment inventory and health.

The TISC will be the primary user of the MOMS. SRTA requires visibility into the system to monitor maintenance activity but will not modify any data within the MOMS.

The general requirements for the MOMS are as follows:

No.	General Maintenance Online Management System Requirements
	The MOMS shall monitor and collect data on the ETCS and equipment status continually, 24 hours a day, seven (7) days a week.
	The MOMS shall support automated and manual asset inventory entry, tracking (usage and reorder points), and control.
	The MOMS shall support the creation and maintenance of preventive maintenance schedules.
	Access to the MOMS shall be controlled by user and role attributes assigned to users based on the User Access Level Matrix described in Section 2.2.5.1: TFH Connectivity and User Access.

No.	General Maintenance Online Management System Requirements
	The MOMS shall not allow any user to modify the timestamps of any events without SRTA approval.

#### 2.2.5.19.1 *Monitoring and Diagnostics*

System monitoring refers to the practice of regularly checking the health and performance of a computer system or network. This can be done manually or automated and can involve checking various aspects of the system such as resource utilization, application performance, and network connectivity.

Diagnostic requirements refer to the specific tests or checks that need to be performed in order to identify the cause of a problem with the system. These requirements can vary depending on the nature of the problem and the specific system being monitored.

Some common system monitoring and diagnostic tasks include:

- Monitoring system resources such as CPU usage, memory usage, and disk space utilization.
- Monitoring application performance and availability.
- Monitoring network connectivity and performance.
- Running diagnostic tests to identify the cause of problems.
- Gathering and analyzing log files.
- Running system and security scans to identify vulnerabilities.

It is important to have a system in place for monitoring and diagnostics in order to identify and resolve problems with a system as quickly as possible. This can help to ensure that the system is running efficiently and effectively and can minimize downtime and other disruptions.

The MOMS will provide a system for monitoring the status of all equipment, applications, and services in operation within the ETCS.

The requirements for the MOMS monitoring and diagnostics are as follows:

No.	MOMS Monitoring and Diagnostics Requirements
	The MOMS shall provide a user interface that allows users to observe the operational statuses of the SRTA network, Toll Point, Toll Point subsystems, Toll Facility Host, and interfaces in near real-time.
	The user shall be able to define groups of equipment and applications that can be selected for observation.
	All monitored equipment shall support the Simple Network Management Protocol (SNMP) if supported by the manufacturer.

#### 2.2.5.19.2 *Work Order Management*

The MOMS is required to facilitate the generation and assignment of Work Orders for the duration of the Contract.

The requirements for Work Order Management are as follows:

No.	MOMS Work Order Management Requirements
	The MOMS shall automatically generate, assign, and track Work Orders for preventative maintenance, and corrective maintenance.
	The MOMS shall be capable of automatically generating a Work Order when an asset, application, interface, system, subsystem, or service in operation fails, malfunctions, or becomes degraded or unavailable.
	The MOMS shall support a minimum of three different Work Order priorities as defined by SRTA.
	Upon generation of a Work Order, the MOMS shall automatically assign a Priority Level.
	Upon the generation of a Work Order, the MOMS shall automatically alert a technician on a schedule consistent with the assigned Priority Level.
	The MOMS shall enable authorized users to create Work Orders manually.
	<p>Work Orders shall contain at least the following information, as applicable and available during the repair process:</p> <ol style="list-style-type: none"> <li>1. Work Order ID.</li> <li>2. Facility/Warehouse Name.</li> <li>3. Direction.</li> <li>4. Lane.</li> <li>5. Site.</li> <li>6. Mile Marker.</li> <li>7. Asset Name.</li> <li>8. Asset Type.</li> <li>9. Asset Location.</li> <li>10. Asset Tag (assigned barcode or other machine-readable number).</li> <li>11. Asset Serial Number.</li> <li>12. Software Version (if applicable).</li> <li>13. Failure Code.</li> <li>14. Failure Description.</li> <li>15. System(s) Impacted by Failure.</li> <li>16. Assigned Priority Level.</li> <li>17. Work Order Creator.</li> <li>18. MOMS Maintenance Type (Corrective/Preventative).</li> <li>19. Assigned Technician.</li> <li>20. Datetime of Failure.</li> <li>21. Datetime of Acknowledgement.</li> <li>22. Escalation Time (if applicable).</li> <li>23. Datetime of Repair.</li> <li>24. Calculated Time to Acknowledge.</li> <li>25. Acknowledge Time Breached SLA Requirement (Y/N).</li> <li>26. Calculated Time to complete Final Repair.</li> </ol>



No.	MOMS Work Order Management Requirements
	27. Repair Time Breached SLA Requirement (Y/N). 28. Stop Clock Implemented (Y/N) (Stop Clock Conditions are defined in Appendix E: Service Level Agreements (SLAs)). 29. Stop Clock Start Datetime. 30. Stop Clock End Datetime. 31. Stop Clock Reason. 32. Calculated Duration of Stop Clock. 33. Duration of WO (including Acknowledge, Escalation, Repair, and Stop Clock Times). 34. Summary of Repair Activities. 35. Change Request Form (CRF) ID, if applicable.
	Work Order entries shall be recorded using standardized terminology and codes where possible.
	The MOMS shall provide a drop-down field with standardized descriptions (approved by SRTA) for the error or event.
	The MOMS shall permit an authorized user to enter a free form description for the error or event.
	The error or event description field shall be searchable.
	The MOMS shall enable users to schedule one-time or recurring preventive maintenance tasks for a specified duration(s).
	The MOMS shall track the status of Work Orders from generation to closeout.
	The MOMS shall update the status of Work Orders as work is performed.
	The MOMS shall update the status of Work Orders when they are closed.
	The TISC staff shall be equipped with portable devices giving them access to the MOMS.
	The mobile version of the MOMS shall allow TISC staff to enter data into the system.
	The mobile version of the MOMS shall allow TISC staff to manage Work Orders.
	The MOMS shall calculate the following information automatically for each Work Order: <ol style="list-style-type: none"> <li>1. Initial acknowledgement times.</li> <li>2. Response times (whether remote or on-site).</li> <li>3. Repair times.</li> <li>4. Lane and system down time.</li> </ol>
	The MOMS shall enable users to search for Work Orders by: <ol style="list-style-type: none"> <li>1. Work Order ID.</li> <li>2. Created Datetime.</li> <li>3. Facility.</li> <li>4. Direction.</li> <li>5. Toll Point.</li> <li>6. Lane.</li> <li>7. SRTA Nomenclature Name.</li> <li>8. Priority Level.</li> </ol>

No.	MOMS Work Order Management Requirements
	9. Asset Type, Model or Part Number. 10. Work Order status. 11. Error and event codes. 12. Maintenance Technician. 13. Disposition Status of Asset. 14. CRF ID (if applicable).
	The MOMS shall enable users to view a list of all Work Orders.
	The MOMS shall enable users to filter the list of Work Orders by: <ol style="list-style-type: none"> <li>1. Work Order ID.</li> <li>2. Created Datetime.</li> <li>3. Datetime range.</li> <li>4. Facility.</li> <li>5. Direction.</li> <li>6. Toll Point.</li> <li>7. Lane.</li> <li>8. SRTA Nomenclature Name.</li> <li>9. Priority Level.</li> <li>10. Asset Type, Model or Part Number.</li> <li>11. Status.</li> <li>12. Error and event codes.</li> <li>13. Maintenance Technician.</li> <li>14. Disposition Status of Asset.</li> <li>15. CRF ID (if applicable).</li> </ol>
	The MOMS shall enable users to sort Work Orders by any displayed field.
	Travel times to service the MOMS alerts shall be included in all down time calculations.
	The TISC shall enter all information associated with Work Orders into the MOMS prior to closing the Work Order.
	No additional changes shall be made to Work Orders after they have been closed.
	The MOMS shall escalate Work Orders that have not been acknowledged by the appropriate technician within a configurable time of the initial notification.
	The MOMS shall support escalation by Priority Level and a configurable escalation order.
	The MOMS shall enable technicians to enter their actual arrival time and time of work completion.
	The MOMS shall enable technicians to enter their information at the site of the maintenance issue or remotely.
	After work is performed, the MOMS shall update the status of the Work Order with information entered by the technician including the description of the event, work performed, and materials used.

No.	MOMS Work Order Management Requirements
	For all repair activities, the details of the repair shall be recorded and tracked in a Work Order in the MOMS.
	For all repair activities, the details of the parts disposition, including parts retired, shall be recorded and tracked in a Work Order in the MOMS.
	The MOMS shall allow the assigned and responding technician to close out the Work Order when the defective asset is restored.

#### 2.2.5.19.3 *Manufacturer's Warranties*

The requirements for the Scheduled Services for Manufacturer's Warranties are as follows:

No.	MOMS Manufacturer Warranty Requirements
	The TISC shall identify (via the MOMS) the warranty status for all hardware and software, including all spares, in the ETCS along with the remaining warranty period, if applicable.
	The MOMS shall track the manufacturer's warranty maintenance requirements for all ETCS assets under a manufacturer warranty.
	The TISC shall utilize the MOMS to maintain warranty information (e.g., start datetime, duration, expiration datetime, contact information, responsibilities, and obligations of the parties).

#### 2.2.5.19.4 *Inventory Control Subsystem*

The TISC is required to provide an Inventory Control Subsystem (ICS) as a part of the MOMS. The purpose of ICS is to maintain accurate and up-to-date records of all assets kept in inventory as spare parts, installed within the Facilities, or removed and disposed of.

The requirements for the Inventory Control Subsystem are as follows:

No.	MOMS Inventory Control Subsystem Requirements
	The MOMS shall include an automated ICS for entering, tracking, and controlling the movement of all equipment purchased or acquired for the use of implementation, operation, and/or maintenance of the ETCS.
	The TISC shall apply a unique asset tag on all ETCS Equipment.
	The TSC shall place the asset tag in a readily accessible and uniform area for all similar Equipment.
	The TISC shall provide sufficient asset tag scanning equipment necessary to process asset tags for the Inventory Control Subsystem.
	The MOMS shall track the full history for each inventory Asset from: <ol style="list-style-type: none"> <li>1. Initial purchase to storage at TISC maintenance warehouse.</li> <li>2. Warehouse to Installation.</li> <li>3. Installation to Warehouse.</li> <li>4. Warehouse to RMA.</li> <li>5. Warehouse to Disposal.</li> </ol>

No.	MOMS Inventory Control Subsystem Requirements
	The MOMS shall log which TISC maintenance staff handles assets throughout the lifecycle of the asset.
	The MOMS shall provide a user interface to support entry of each Asset into the ICS.
	<p>The TISC shall provide the following information in the ICS for all ETCS assets:</p> <ol style="list-style-type: none"> <li>1. Part Type/Model Number.</li> <li>2. Part Descriptions.</li> <li>3. Serial Number.</li> <li>4. Vendor/Manufacturer.</li> <li>5. Primary Vendor/Manufacturer Contact Information.</li> <li>6. Alternative Vendor/Manufacturer Contact Information.</li> <li>7. Last Invoice Price for Asset.</li> <li>8. Last Order Lead Time (order to delivery).</li> <li>9. Reorder threshold.</li> <li>10. Datetime Entered in the System.</li> <li>11. Location Name.</li> <li>12. Location Geocoordinates.</li> <li>13. Datetime of Location Changes.</li> <li>14. ID of Maintenance Staff responsible for change.</li> <li>15. Warranty Information.</li> <li>16. End of Life Information.</li> </ol>
	All equipment information entered and included in the ICS shall use SRTA's nomenclature.
	The TISC maintenance personnel shall be able to directly enter all assets (operational units, spare inventory, test equipment, etc.) into the MOMS by scanning an asset tag applied by the TISC.
	The ICS shall be integrated with the Work Order process to track usage of all assets.
	The MOMS shall calculate and track the purchased value of inventory assets with and without depreciation.
	The MOMS shall use a straight-line depreciation model for calculating the depreciation value of all assets.
	The MOMS shall have the capability to record the physical inventory, cycle count details, and update the inventory accordingly with reason for the difference found in the physical inventory count.
	The TISC shall provide SRTA with a report itemizing all spares and consumables in SRTA's inventory monthly.
	The MOMS shall manage lifecycle and warranty data for all assets and application licenses.
	The MOMS shall be capable of maintaining vendor lists for any ETCS assets.

#### 2.2.5.20 TFH Events and Alerts

The TFH, inclusive of the MOMS, is required to generate alerts for all subsystem, equipment, application, device, and service events occurring in the ETCS as defined in Table 12 below and as updated during the design phase. Alerts will aid SRTA staff and TISC maintenance personnel in monitoring the ETCS and resolving equipment or application failures as soon as possible by detecting issues and notifying the appropriate personnel.

Events are defined as any observed changes to the normal behavior of a subsystem, equipment, application, device, or service. Events can fall into three categories based on the significance of the event: informational, warning, and alarm.

1. Informational events present information such as when a status changes or an action is complete. An example of an informational event is a new rate plan going into effect.
2. Warning events are generated when the subsystems, applications, or devices monitored are approaching a configurable threshold. An example of this is when a rate schedule detects a lapse in rate plans 5 days ahead.
3. Alarms are generated when a subsystem, application, or device is currently operating above or below a pre-configured parameter and is experiencing a degradation or complete loss of functionality.

Events can be configured to create alerts. An alert is a notification that an event has occurred. Alerts are sent to designated recipients for further processing or situational awareness. Alert notifications are preconfigured to be sent to a number of recipients via email, SMS, and/or in-application message.

The TFH as referenced in this section is inclusive of the MOMS. The MOMS must meet all requirements defined below regardless of the level of MOMS application integration into the TFH application.

The requirements for Events, Alerts, and Notifications are as follows:

No.	Events, Alert, and Notifications Requirements
	The TFH shall enable users to configure each of the following categories of events: <ol style="list-style-type: none"><li>1. Informational.</li><li>2. Warning.</li><li>3. Alarm.</li></ol>
	The TFH shall enable users to make changes to event definitions and thresholds.
	The TFH shall enable users to configure which events generate alerts.
	The TFH shall enable users to configure alert notification messages for TFH alerts.
	The TFH shall enable users to configure alert notification recipients.
	The recipients for alert notifications shall be assigned via user role attributes, individual users, or a combination of the two.
	The TFH shall enable users to configure alert notification types to be either an email, SMS, in-application message or a combination of the three.
	The TFH shall implement configurable alert priorities.
	The TFH shall enable users to identify which users shall receive which alerts and via which method with filtering by level of alert priority.

No.	Events, Alert, and Notifications Requirements
	The TFH shall provide the function to define events which can create ongoing alerts and the frequency of repeating if the situation is not resolved. E.g no rate plan in effect.
	Alert notifications shall be sent to one or more designated recipients via an email, SMS, in-application message, or a combination of the three.
	The TFH shall enable users to unsubscribe from alerts or change the priority levels for the alerts they should receive.
	The TFH shall record all events as defined in Table 12: Minimum required Events/ Alerts.
	The TFH shall report on all events and alert notification messages generated.
	<p>During the Design Phase, TISC shall create an Events and Alerts matrix of all events tracked by the TFH that includes the following information:</p> <ol style="list-style-type: none"> <li>1. Event Name.</li> <li>2. Event Description.</li> <li>3. ETCS Component Affected.</li> <li>4. Event Type: <ol style="list-style-type: none"> <li>a. Informational.</li> <li>b. Warning.</li> <li>c. Alarm.</li> </ol> </li> <li>5. Alert created? (Y/N).</li> <li>6. Notification Type(s) appropriate to this event: <ol style="list-style-type: none"> <li>a. Email.</li> <li>b. SMS.</li> <li>c. In-Application.</li> </ol> </li> <li>7. Intended Recipients: <ol style="list-style-type: none"> <li>a. User Roles.</li> </ol> </li> <li>8. Priority.</li> </ol>
	The Events and Alerts Matrix shall be reviewed and approved by SRTA.
	The TFH shall enable users to configure the subject line and body of alert notifications sent via email.
	The TFH shall enable users to configure alert notification email subject line and body to support searching by the ETCS component affected.
	The TFH shall display in-application alert notifications in a window, tab, or sidebar within the TFH user interface if the receiving user is logged in to the application.
	Displayed alert notifications shall not restrict the user's view or utilization of the other data and functionality on the screens/dashboards.
	The TFH shall only display in-application alert notifications in the application screens of the configured recipients of the notifications.
	The in-application alert notification shall be displayed as unacknowledged until acknowledged or "read" by the recipient user.
	The TFH shall enable users to acknowledge or "read" in-application alert notifications.

No.	Events, Alert, and Notifications Requirements
	For all warnings, authorized users shall be able to configure the number of times consecutive warning alerts are generated as a count down after the configurable threshold is initially crossed (e.g. 5 days until rate plan expires, 4 days until rate plan expires, 3 days, etc.).
	For all alarms, the TFH shall enable users to configure how frequent the alarm may generate if the cause of the alarm persists beyond the initial alarm.
	The TFH shall enable users to “mute” receiving recurring individual alerts for 10, 30, or 60 minutes.
	For alert notifications that have a minimum threshold of number of recurring alarms, the alarm shall be sent once the threshold is reached.
	The TISC shall work with SRTA during the design phase to identify all events that will result in alerts and notifications.
	In addition to the TISC’s standard system events and the SRTA defined events, the TISC shall be responsible for designing, developing, implementing, and testing up to twenty-five (25) custom events based on SRTA’s requirements during the Contract term.

#### 2.2.5.20.1 SRTA Defined Alerts

It is anticipated that the TISC will have a standard set of events that result in alerts. SRTA has identified a number of events that should result in alerts that may be in addition to the TISC standard offering. The table below describes the minimum required events and associated alerts that are required by SRTA. For each event, the TFH shall allow configuration to allocate the Event Type (informational, warning, or an alarm) and the available notification types (Email, SMS, or In-Application Message).

**Table 12: Minimum required Events/ Alerts**

Event Description
Scheduled Audit Set List delivered
Scheduled Audit Set List failed to deliver
Manually created Audit Set List delivered
Manually created Audit Set List failed to deliver
Assigned Audit Set List completed
Percent of images coded-off by system exceeds a configurable percentage of daily total images reviewed
Scheduled rate plan is expiring in a configurable number of days in the future
Scheduled rate plan went into effect
No rate plan scheduled starting in a configurable number of days in the future
Rate plan schedule sent for approval/awaiting approval
Rate plan schedule approval request granted
Rate plan schedule approval request rejected
Upcoming holiday in a configurable number of days in the future

Event Description
Standard Manual or Alphanumeric Override went into effect
Standard Manual or Alphanumeric Override in effect for over a configurable number of days (repeating until standard override ends)
Standard Manual or Alphanumeric Override is expiring in a configurable number of days in the future
Standard Manual or Alphanumeric override ended
Unable to publish rates to the TRDMS
Failover rate plan in use
Failover rate plan in effect for more than a configurable number of days (repeating until failover rate plan ends)
Failover rate plan ended
New rate schedule to be effective in a configurable number of days in the future
Insufficient data from Traffic Sensors for Congestion Pricing Algorithm
Unposted Trip in TCS is older than a configurable number of days
Trip rejected from posting to CBO
Percent of configurable Trip type (i.e., plate based, mixed, pattern, assumed entry/exit Trips) over past 24 hours exceeds a configurable percentage
Percent of Trip confidence below a configurable confidence over past 24 hours exceeds a configurable percentage
System Configuration Parameter has been updated
TFH interface fails to transmit commands to the GDOT ATMS
Automatic or manual reversal command failed to execute successfully
Wrong way vehicle (WWV) detected
Interface failed to send data
Interface failed to receive acknowledgement
Interface data received is corrupted
Scheduled report failed to deliver
Schedule report successfully delivered or ready to download
Data storage utilization reaches a configurable capacity
Vehicle on Notification List detected
Traffic incident created in Incident Log
Traffic incident closed in Incident Log
Zone controller failover or outage occurs
Zone controller start-up failure
Zone controller start-up diagnostic check
Incomplete or duplicate Transactions detected exceeds configurable volume



Event Description
Zone controller files and data failed to transmit to the TFH
VES Camera Average ALPR Confidence falls below configurable number
TFH loses communication with the TRDMS
TFH loses communication with other roadside equipment or external interfaces
ETCS asset failure or degradation
Loss of power
UPS begins to power tolling equipment
UPS battery level reaches a configurable threshold
Alternate power in use
Utility power has been restored
Asset inventory level falls below configurable number for an asset type
Asset warranty is expiring within a configurable number of days
Work Order Generated
All additional events and alerts necessary to provide maintenance services to ensure the ETCS is operating per design.

## 2.3 Network and Communications Requirements

The TISC shall be responsible for the network equipment, configuration and network connections according to the demarcation points.

### 2.3.1 Network Design

The TISC is responsible for the design, procurement, and provision of the SRTA Tolling network. This includes:

1. Network system communications equipment.
2. Local Area Network for each Facility.
3. Connectivity to SRTA's MAN.
4. WAN connectivity.

The network design requirements are as follows:

No.	Network Design Requirements
	TISC shall conduct workshops to gather necessary information to develop a network architecture document providing sufficient detail to ensure all network and system performance requirements are met.
	The network architecture document shall be submitted to SRTA for review and approval during the Design Phase.
	The network architecture document shall:

No.	Network Design Requirements
	<ol style="list-style-type: none"> <li>1. Include a logical network diagram, which will be a living document. This diagram will be provided in Microsoft Visio format. This diagram will be updated throughout the Project to reflect changes to the toll network and will include a change log documenting the changes and updates from version to version. This diagram will be the basis for the network As-Built.</li> <li>2. Provide data loading analysis that identifies the type, amount, and frequency of data transmission as well as the data flow through all communications paths. An analysis of bandwidth requirements for each data path shall be provided.</li> <li>3. Contain drawings and diagrams that indicate the function of each network hardware component, indicate termination points of each, and interconnections to other Equipment.</li> <li>4. Contain detailed diagrams and technical specifications of network components, hardware, software, communications protocols, and network topologies to be used in the system design.</li> <li>5. Detail the techniques utilized to ensure the network(s) shall meet the volume of transaction/data traffic to meet the system performance requirements.</li> <li>6. Provide descriptive material (manuals, cut sheets, drawings, brochures, etc.) for each proposed type of network equipment that: <ol style="list-style-type: none"> <li>a. Clearly demonstrates the Equipment will meet the functional objectives of the toll system.</li> <li>b. Provides sufficient technical data for a complete evaluation of the equipment and network design by SRTA staff.</li> </ol> </li> <li>7. Include information necessary for the proper installation, start-up, initialization, and operation of the item.</li> <li>8. Describe failure and degraded mode handling and recovery from failure. This should describe types of failures, the process for reporting these failures and how the fault tolerance of the system will ensure that all performance requirements are met.</li> </ol>
	Each toll site within a defined Facility shall be connected to two independent hub buildings.
	The network design must be resilient to any single point failure, such that in the event of any single point failure of network equipment or software, including WAN single point failure, there shall be no loss of system performance and all network traffic shall be appropriately rerouted without manual intervention.
	In the event of loss of communications with a hub building, the tolling network shall automatically, without administrator action, re-route all network traffic to the other available hub building.
	The TISC shall provide circuits from a minimum of two different service providers at each facility pair. (i.e. one circuit per Hub but different providers within facility pair).
	During normal operations, the TISC shall provide the total number of WAN circuits capable of load balancing to provide optimal throughput to the cloud environment.
	In the case of an outage, the TISC shall provide enough remaining circuit(s) capable of supporting the full bandwidth requirements of the Project. SD-WAN is the preferred solution, but other solutions may be allowed with SRTA IT approval.

No.	Network Design Requirements
	The network architecture document for each Facility shall be updated before the start of the Facility's OAT.
	The network architecture document shall include information for how each Facility is connected within the overall scope of the TISC network.
	The TISC network shall be designed to route all CCTV camera streams to the SRTA TOC operators located at the TMC and SRTA Headquarters staff. The SRTA MAN will be used by the TISC to transmit the video traffic. The SRTA MAN is designed to provide 2 physical paths back to the TMC and SRTA headquarters for each Facility.
	All elements of the Toll System network shall be compliant with SRTA's Security Policies.
	As part of the systems design document, the TISC shall: <ol style="list-style-type: none"> <li>1. Establish a baseline design of the Tolling networks before the Factory Acceptance Test.</li> <li>2. Notify SRTA of any proposed design change to the network(s) design.</li> <li>3. Regression test each proposed design change.</li> <li>4. Obtain SRTA approval of any proposed design change.</li> </ol>

### 2.3.2 Network Equipment

Each toll equipment cabinet location will be connected on the local area network back to the two (2) designated Project hub building locations. For I-75A, this is Hubs BB and CC. For I-75B this is Hubs ZZ and A. For I-85A this is Hubs C1 and D. For I-85B this is Hubs Y and DD. SRTA is responsible for all network equipment/switching for the MAN.

The requirements for network equipment area as follows:

No.	Network Equipment Requirement
	The TISC shall provide and configure all network equipment necessary to interface with SRTA provided fiber and network demarcation points in order to create the ETCS network to support the functionality and performance described by these requirements and associated SLAs.
	All equipment and other materials, other than current equipment that will be re-used as permitted by this RFP, shall be new, field-proven, and meet applicable ISO, IEEE, and ANSI standards.
	To ensure compatibility with SRTA's current network infrastructure, any new network switches shall be purchased from a Cisco authorized reseller that is listed on the GA NEIT State contract: Contract Number: 99999-SPD-T20120501-0006 and shall enter into a Partner-to-Partner agreement with that reseller.
	State Road and Tollway Authority shall be listed as the end customer of record on any Cisco hardware, software and licenses purchases. TISC will be added to the account in order to create TAC cases and receive full support for the equipment purchased under this agreement.
	TISC shall warrant that all products are new and in their original box. Where applicable, TISC shall provide SRTA with a copy of the End User license agreement and shall warrant that all OEM software is licensed originally to SRTA as the original licensee authorized to use the OEM Software. SRTA reserves the right to validate with the OEM all products delivered to ensure

No.	Network Equipment Requirement
	<p>compliance with the above provisions. TISC consents to no cost (cancellation)/replacement of the non-compliant awarded items if, upon inspection or OEM registration after delivery:</p> <ol style="list-style-type: none"> <li>1. Any products provided are not recognized or acknowledged by the OEM as new and original products, or</li> <li>2. Any products provided are not recognized or acknowledged by the OEM as having been supplied through authorized distribution channels in the United States, or</li> <li>3. That offeror was not appropriately authorized by the manufacturer to sell the product.</li> </ol>
	No elements of the network equipment shall be susceptible to electromagnetic emissions from other equipment.
	The TISC shall enter or update all details of each network equipment element into the MOMS immediately after receiving such an element.
	The TISC shall be responsible for all elements of the Local Area Network (LAN).
	The TISC shall be responsible for all internet circuits connecting the Tolling network to the internet cloud.
	Once network design is finalized, the TISC shall certify in writing that the network design meets all contract performance requirements.
	TISC provided LAN equipment shall be capable of supporting IPv6 addresses.
	TISC shall coordinate with SRTA and existing toll vendor to obtain the existing IP addressing schema.
	The LAN within a toll site shall be connected by CAT6A cabling.
	The LAN connections from the gantry to the roadside equipment shall either be CAT6A or multi-mode fiber-optic (MMFO) cable, according to TISC design.

### 3 Transition

This section addresses requirements that apply to the transition of the two tolling systems provided by the existing TSIs to the new TISC tolling solution.

The tables of requirements included throughout this section represent the TISC requirements for the transition. This section also provides the following narrative to describe SRTA's expectations for the overall transition effort.

In addition to this narrative, SRTA has documented its theoretical vision of the transition approach in the transition diagrams for the I-75A/B and I-85A/B facilities and can be found in Appendix D: Transition of Existing Facilities Diagrams. The intent of these diagrams is to compliment the narrative and requirements set forth in this section and aid the TISC in understanding the complexities and nuances of the SRTA facilities as it relates to the transition approach. The diagrams should be used to form an understanding of SRTA's vision but are not intended to constrain the TISC in developing their unique and robust transition approach. The intent is to allow flexibility to the TISC to develop and propose a transition approach that is consistent with their experience of successful transitions, the uniqueness of their solution and aligns with the SRTA vision.

The transition of the existing facilities will be executed against a SRTA-approved Transition Plan. All proposers are required to submit their recommended Transition Plan with their proposal response. Refer to requirements for the Transition Plan in Section 4.7.1: Transition Plan.

The transition approach for the existing TSI toll facilities is to include all system testing requirements as set forth in this RFP.

There are pre-requisites that must be satisfied prior to the start of transition activities for both the Toll Facility Host (TFH) and the existing TSI toll facilities. These pre-requisites include:

1. SRTA approval of the Transition Plan.
2. SRTA approval of completion of the System Design and Development phase to include the Gap Analysis.
3. SRTA approval of the final DDD.
4. SRTA approval of the Master Test Plan.
5. SRTA approval of the Factory Acceptance Test Plan (TFH and Roadway)
6. SRTA approval of the Network Transition Plan.
7. SRTA approval of the FAT (TFH and Roadway).
8. SRTA approval of the TFH revenue ready test (RRT).
9. SRTA approval to start transition activities.

Once the prerequisites listed above have been met, including SRTA approval to start transition activities, the transition plan can be executed as approved. As part of system validation prior to the TISC TFH becoming the revenue system of record, the TISC must demonstrate, using a shadow mode, that the TFH can receive and accurately process transactions from the existing toll facility pair that will be transitioned. This period will allow analysis of trips formed by the TISC prior to the TFH cutover and Go Live. The next step of the transition approach is for the TFH to become the revenue system of record for one of the two existing TSI toll facility pairs (I-75A/B, I-85A/B). The revenue system of record is defined as the system that SRTA uses to operate the facility and post rated trips to SRTA's existing CBO. With SRTA approval for Go Live of the TISC TFH for that first toll facility pair, the TISC TFH will become the revenue system of record and the conversion of the existing TSI roadside system will commence. During this period of transition of the roadside equipment, the TISC will be responsible for the system performance and maintenance of each toll zone and associated network/communications as they are transitioned. The legacy system provider will continue to maintain all legacy roadside sites until transitioned or decommissioned by the TISC.

This conversion will include updates/upgrades to the associated network if necessary and as approved by SRTA, replacement of all equipment as approved in the Installation Plan, Site Installation Checklists and Site Commissioning Tests (SCT) for every site. A SRTA-approved First Site Integration test (FSIT) shall be completed for the first site on each facility including End-to-End testing. A SRTA-approved OAT will then be conducted for the facility pair. With an approved OAT, transition is to progress to the second existing TSI toll facility pair and follow the same process for completion to include the TISC TFH becoming the revenue system of record for the existing TSI toll facility in advance of the roadside equipment and network conversion commencing.

The TISC may offer a Pre-Installation Activity approach that supports an expedited schedule and efficient use of time during other phases of the project. The TISC is encouraged to evaluate and propose installation activities that can be done without impacting the legacy system and production data. If identification of installation activities for ITS and Travel Time equipment can be done up to the point of intersection of the legacy solution and/or identifying devices that can cohabitate with the legacy equipment without interfering with the legacy solution this should be presented to SRTA for review, comment and approval. All applicable requirements must be met for these pre-installation activities such as installation plan, design and shop drawings, transition plan etc.

The TISC transition approach shall meet the following requirements:

### 3.1 General Transition Requirements

No.	General Transition Requirements
	The TISC shall manage the Transition according to the approved Project Schedule.
	The Transition of the existing facilities will be executed according to the SRTA-approved Transition Plan.
	The TISC shall, before beginning any Transition activities, provide proof that the nine (9) prerequisites listed in the introduction of this Transition section (2.3.2) are met.
	The TISC shall fully transition one complete Facility Pair before starting transition of the second Facility Pair.
	The Time-of-Day Pricing Algorithm shall be in effect for the full duration of the Transition period. These static rates must be approved by SRTA prior to being activated in the Production environment.
	To the extent feasible, Roadside ITS equipment (DMS, Travel Time Readers, CCTV cameras and video storage systems) shall be transitioned prior to transitioning roadside Toll Points.
	The TISC TFH shall become the revenue system of record (Go Live) for an existing TSI toll facility pair prior to commencement of transition of the roadside tolling system for that facility pair.
	When the TISC TFH becomes the revenue system of record for an existing TSI toll facility pair, the TISC is responsible for system performance and maintenance of only the newly transitioned zones while the legacy vendor continues to maintain the legacy equipment until all zones for that toll facility pair have been transitioned (1 in, 1 out). This includes any communication equipment, fiber laterals connecting to the TSI equipment, ITS devices not yet transitioned by the TISC.
	Once the TFH becomes the system of record for a toll facility pair, all transactions and images from legacy toll points via the transaction convertor (described below) and TISC toll points shall be processed by the TFH to create trips that will be sent to the CBO.
	During Transition, Time of Day pricing will be implemented to support the transition of the ETCS.
	The roadside toll facilities shall be transitioned one facility pair at a time (i.e., I-75A/B or I-85A/B).
	The system and transition shall be designed to allow a Revenue Ready Test to be conducted for the second facility pair using the system that is in full production for the first facility pair.

No.	General Transition Requirements
	Transactions processed as part of the RRT for the second facility pair shall not enter the CBO production environment, become part of TFH production reporting or otherwise impact production operations, audit or financial processing for the first facility pair.
	The ability to separate RRT transactions from production transactions for the two facility pairs shall be tested as part of the RRT for the first facility pair.
	For each facility pair, the TISC shall first transition the facility that generates the lowest revenue amount of the pair.
	The transition approach shall ensure toll system revenue is minimally degraded during the transition period.
	The transition for Toll Points shall be rapid and methodical.
	A transitioned site is placed into revenue collection only after tuning and successfully passing the SRTA-approved SCT.
	The transition is designed to minimize risk to SRTA Operations.
	The new TISC tolling solution shall co-exist with the existing TSI toll systems without issue until all transitions are completed.
	The transition design and approach must allow the responsible party for system performance and maintenance to be clearly defined along with documented key milestones for system handover for each step of the transition process.
	The time period from the date of SRTA-approval for Go Live of the TFH for the first toll facility pair to be transitioned, until the complete conversion of the associated TSI roadside tolling system to the new TISC-provided roadside tolling system for the first facility pair shall take no more than [XX months].
	The time period from the date of SRTA-approval for Go Live of the TFH for the first toll facility pair until the award of ETCS Final System Acceptance shall take no more than [XX months].
	The Transition shall ensure minimal degradation in toll system revenue generation during the transition period by meeting or exceeding the “Transition SLAs” as defined in Appendix E: Service Level Agreements (SLAs).
	The TISC shall be responsible for performance and maintenance of the newly transitioned zones while the legacy vendor continues to maintain all legacy zones until all zones have been transitioned and decommissioned.
	The Transition requirements shall include removal, installation, and tuning of each Toll Point and ITS site (See Appendix B: SLDs).
	The Transition shall include the decommissioning for I-85 Toll Points and Travel Time Sites as presented in Appendix C: Existing Infrastructure Tables.
	The TISC will maintain network efficacy and stability throughout the transition.
	The TISC shall provide at least one (1) TOC workstation per facility pair as required to meet the operational capabilities prior to go-live of the facility pair.
	The TISC shall limit equipment to be installed into the existing networks to only that equipment approved in the Bill of Materials in the TISC contract.

No.	General Transition Requirements
	During Transition of I-75, the TISC shall be responsible for receiving the GDOT reversal messages and coordinating reversal between legacy and TISC roadside equipment using the transaction convertor.
	All toll facility transitions shall be conducted such that revenue loss and customer facing outages are minimized.
	For the existing I-75 toll facilities, the TISC shall physically transition only one Toll Point at a time.
	Transition shall be designed and planned such that no toll point shall be out of service for more than [] <sup>3</sup> days. Out of service is defined as the time from when the legacy TSI toll point is turned off to completion of FSIT, FCT and tuning on the TISC Toll Point and SRTA approved connection to TFH for transaction processing.
	When modifications are made to the existing toll systems and/or network in support of system testing, the TISC shall return the toll systems and/or network to its original configuration and demonstrate normal production operations prior to progressing to the next step in the process.
	For the existing I-85 toll facilities, the TISC shall physically transition no more than 1 gantry per pricing segment at one time.
	The network will be transitioned from the current configuration for the existing facilities to the new/modified configurations to support the new TISC tolling solutions with minimal to no interruption to production tolling operations. It is envisioned by SRTA that this will start with establishing a parallel network for each toll facility pair using current dark fibers.
	The TISC shall include with the network architecture an IP scheme using SRTA's existing and approved IP Addressing Standards, VLANs, and nomenclature.
	The TISC shall be responsible for performance and maintenance of the parallel network when the TISC TFH becomes the revenue system of record for an existing TSI toll facility pair through the transition. The legacy vendor shall be responsible for any network connectivity and/or performance that is still communicating to the legacy equipment.
	The TISC shall be responsible for the Image review for all images (legacy and new) during the transition period.
	The TISC shall ensure that they can perform a complete rollback process to the legacy solution for the TFH and the Network (prior to any toll sites being installed).
	When modifications are made to the existing toll systems and/or network in support of system testing, the TISC shall return the toll systems and/or network to its original configuration and demonstrate normal production operations prior to progressing to the next step in the process.
	The TISC shall conduct installations for the transition of existing facilities in the grouping and order as approved by SRTA.
	When conducting the SCT test on transition facilities, for every Toll Point, the SCT integration test cases shall be conducted with the production TISC TFH.

<sup>3</sup> Number of days shall be included in the next version of this document.



No.	General Transition Requirements
	The TISC shall transition all other ITS equipment associated with the existing TSI toll system prior to OAT for a facility.
	The TISC shall coordinate with SRTA to ensure a seamless transition of TRDMS' with no visual outages.
	The TISC shall decommission the I-85 Toll Points as approved by SRTA in the Transition Plan.
	For all Tolling point identified as being decommissioned by the TISC, they will continue to be utilized and processed through the TFH transaction converter for Trip Building until they have been decommissioned and removed from service.
	The TISC shall decommission the AVI Travel Time sites as approved by SRTA in the Transition Plan.
	The TISC shall enable network communications to permit the TISC to access legacy ITS equipment and existing TSI toll systems as needed to meet or exceed all requirements set forth in this RFP.

### 3.2 Transition of ATMS

No.	General Transition Requirements
	The TISC must take full control of the interface communications with the ATMS prior to any TRDMS, or Toll Point being transitioned by the TISC on the I-75 roadway.
	The TISC shall route/ relay all messages, responses, message confirmations, and message errors between the legacy system and the ATMS for all TRDMS and Toll Points that have not yet been transitioned by the TISC.

### 3.3 Toll Facility Host (TFH) Transaction Converter

To ensure continued operations, a smooth transition, and to avoid data and revenue loss during transition, SRTA is requiring the TISC to provide a transaction converter that will be used to convert the transaction and image data collected by the legacy roadside production tolling system into data to be consumed and used by the TISC TFH. For the existing I-75A and I-75B facilities, the transaction converter will also send roadway reversal commands from the converter to the existing TSI toll zone controllers to signal the existing roadside systems to reverse and handle reversal confirmation messages from the existing TSI. The functionality of the transaction converter to communicate with the existing TSI roadside toll system will need to include the development of the Interface Control Document with collaboration with the legacy TSI.

Following are the requirements of the TISC transaction converter:

No.	TISC Transaction Converter Requirements
	The TISC shall develop a transaction converter for each existing toll facility such that the TISC TFH can consume transactions and images created by the existing roadside systems in the format necessary for the TISC TFH to be able to perform all requirements as set forth in this RFP.

No.	TISC Transaction Converter Requirements
	The TISC shall fully adhere to the approved ICDs that are completed through their collaboration with SRTA and the TSIs, for the collection of transaction data from the existing TSI roadside systems (I-75/I-85).
	For the existing I-75 toll facility, the TISC-provided TFH transaction converter shall conduct roadway reversals, including TRDMS and toll point actions, with the existing TSI roadside tolling systems to include all required reversal functionality, messaging and confirmations as defined in Attachment 5: Roadway Reversal Functionality and using messaging consistent with the GDOT ATMS specification.
	The TISC TFH transaction converter roadway reversal functionality shall be included in the development of the converter ICD with collaboration with the legacy TSI.
	The TISC shall include the detailed design of the transaction converter in the DDD.
	The TISC TFH shall translate the data received by the transaction converter such that trips can be created, rated, and posted to the CBO by the TISC TFH.
	The TISC transaction converter shall be designed to translate both AVI and plate-based transactions, including embedded images or image links, as applicable.
	The design and functionality of the transaction converter shall be fully documented for SRTA's review and approval.
	The TISC-provided Transaction Converter shall accept transactions with images and AVI information.
	The TISC-provided Transaction Converter shall accept image-only transactions.
	The TISC-provided Transaction Converter shall accept transactions with only AVI information.
	The TISC-provided Transaction Converter shall collect and process all data as necessary to enable the TISC-provided TFH to perform all requirements as set forth in this RFP.
	The TISC-provided Transaction Converter shall issue reports and notifications for converter failures.
	The TISC-provided Transaction Converter shall ensure all images that are sent through the converter are stored and retrievable by the IPS.
	The TISC-provided Transaction Converter shall ensure all images that are sent through the converter are stored and retrievable by the CBO.
	The TISC shall include testing all requirements as set forth in this RFP for the transaction converter in both the TFH FAT and TFH Revenue Ready Test with both the I-75 and I-85 facilities.
	The TISC shall deactivate conversion of transactions for a facility pair once all toll points have been converted to the TISC.

## 4 Project Delivery

### 4.1 Project Schedule and Phasing

#### 4.1.1 Master Project Schedule

The TISC shall provide and maintain a Master Project Schedule that reflects all work to be performed for the Project. The Master Project Schedule shall consider all phases of the Project for the entire Term of the Contract. Once approved by SRTA, the schedule will be baselined and from that point forward the baselined schedule will be the one the TISC will be accountable for, regarding work to be performed and Project deadlines to be met.

The requirements for the Master Project Schedule are as follows:

No.	Requirement
	The TISC shall develop a Master Project Schedule listing all tasks, milestones, deliverables, and meetings related to the design, development, testing, installation, deployment, and commissioning of the ETCS for the Toll Facility Host and for each toll facility (I-75A, I-75B, I-85A, I-85B).
	The Master Project Schedule shall include durations, Major Milestones, deliverables' milestones, and resources, and any known dependencies, for all Project tasks, deliverables, and meetings.
	The TISC shall use the approved Master Project Schedule for executing the work for the Project.
	The Master Project Schedule shall identify all milestones and events starting with the Notice to Proceed (NTP), through Final Acceptance of each toll facility pair.
	The Master Project Schedule shall be updated at least monthly and loaded to SRTA's Project Management Platform for review and approval in adherence to Appendix H: Deliverables' Schedule.
	The Master Project Schedule will serve as the baseline for all subsequent schedules and updates throughout the duration of the Contract.
	Prior to the start of transition of the roadside of each toll facility, the TISC shall provide an updated and detailed Master Project Schedule for that toll facility.
	The TISC shall communicate to SRTA any deviation from the Master Project Schedule as soon as the TISC becomes aware.
	The Master Project Schedule shall include the review period for each document submittal in whole and in sections per RFP requirements for SRTA review.
	The Master Project Schedule shall include SRTA and other key stakeholder submittal review cycles.
	At least monthly and as requested by SRTA, the TISC shall produce a 60-day look ahead Project Schedule Report that includes: <ol style="list-style-type: none"><li>1. The completion status of all tasks, activities, and milestones (e.g., deliverable submittal, Project review meeting).</li><li>2. All task activities resource loaded by name for all key employees and for the design and development teams.</li></ol>

No.	Requirement
	3. The identification of any tasks, activities, or milestones that are behind schedule. (For example, if preparation of a deliverable has expended 60% of the scheduled completion time while the completion percentage is only at 50%, this deliverable is behind schedule.). 4. Critical path. 5. The project schedule update files with version control.
	Any modification to the schedule, shall be highlighted in red for SRTA's review. If a task is eliminated, then it shall be struck-through and highlighted for SRTA's review before being eliminated in the following submission.
	All Project schedules shall be submitted as pdf and as Microsoft Project files.
	The TISC shall perform software demonstrations at least weekly when the Project schedule is delayed.

#### 4.1.2 Major Milestones

Major Milestones define the beginning or the end of Project Phases or are related to significant achievements or change of activity during the execution of the Contract. Major Milestones are also connected to payments, SLAs and LDs. **Table 13: Major Milestones** lists the Major Milestones of this Project and describes their connection with payments, SLAs and LDs.

**Table 13: Major Milestones**

MILESTONE NAME	CONDITIONS	TIME [months after NTP]	Triggered by Milestone		
			PAYMENTS	SLAs	LDs Applicable
Notice to Proceed (NTP)	SRTA issues NTP to TISC		Mobilization Fee		
TFH Functionality Agreement	SRTA issues Notice to TISC	3 months	TFH Functionality Fee		
FAT	Successful completion of FAT Submission and approval of the complete DDD	15 months	FAT Success Fee		YES
1st Facility Pair RRT	Successful Network Readiness Test Successful RRT for the first Facility Pair Training for the first Facility Pair completed	21 months	RRT Success Fee Image Review payments for first Facility Pair Warranty payments for first Facility Pair	Transition SLAs for first Facility Pair	YES

			Triggered by Milestone		
MILESTONE NAME	CONDITIONS	TIME [months after NTP]	PAYMENTS	SLAs	LDs Applicable
1st Facility Pair OAT	Successful Operational Acceptance Test for the first facility Pair	36 months	OAT Success Fee	Full SLAs for first Facility Pair	YES
2nd Facility Pair RRT	Successful Network Readiness Test Successful RRT for the second Facility Pair Training for the second Facility Pair completed	39 months	RRT Success Fee Image Review payments for second Facility Pair Warranty payments for second Facility Pair	Transition SLAs for second Facility Pair	YES
Final System Acceptance (FSA)	Successful Operational Acceptance Test of both Facility Pairs Submission and Approval of As-built Documentation Software source code deposit to Escrow	54 months	FSA Success Fee Retainage return Full Operation and Maintenance payments for both Facility Pairs	Full SLAs for both Facility Pairs	YES
Succession Start	Agreement on Scope and Price Change Order issued by SRTA	96 months	Succession support payments	Full SLAs for both Facility Pairs	
Project End	Succession is completed	114 months			

#### 4.1.3 Project Phases

The scope execution is divided into three (3) overall Project Phases, generally delineated by successful completion of Major Milestones or duration. The three Phases are:

- Phase A: System Design and Software Development.
- Phase B: Transition.
- Phase C: Operation and Maintenance.

There are discrete Project phasing requirements for the TISC Contract. The three (3) Project Phases are mutually exclusive, and each Project Phase may start only after the previous Project Phase is completed. Major Project Milestones defining the beginning or end of phases may be connected to payments but also

to LDs. Project Phases and Major Milestones are shown and described in **Figure 13: Project Phasing** and **Table 14: Project Phases** below.

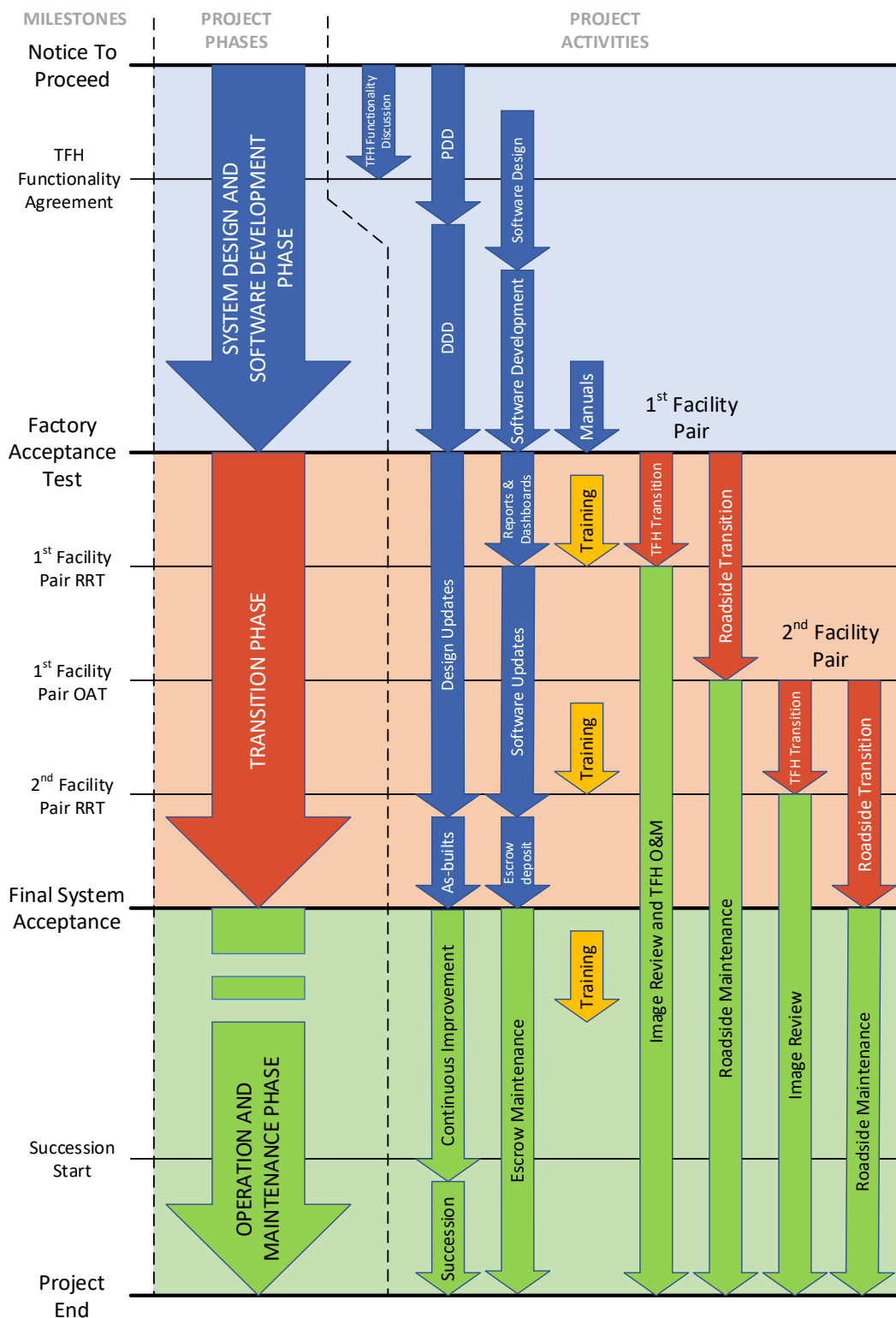


Figure 13: Project Phasing

**Table 14: Project Phases**

	Phase	Beginning	Completion
A	System Design and Software Development	NTP	Successful completion of TFH and Roadside FAT and approval of the complete DDD
B	Transition	Successful completion of TFH and Roadside FAT and approval of the complete DDD	Receipt of Final System Acceptance notice issued by SRTA
C	Operation and Maintenance	Final System Acceptance notice issued by SRTA	Project End - Term of Contract

#### 4.1.3.1 Phase A – System Design and Software Development

Phase A shall start immediately after the NTP and the first activity shall be the refinement of TFH functionality and the agreement on final TFH software functionality and pricing. In parallel, the ETCS design and software design shall start, followed by software development and testing as well as Design Documentation submittals, reviews, and approvals. Part of the documentation to be submitted to and approved by SRTA shall be the Operation and Maintenance Manuals of the ETCS.

Phase II is milestone dependent, and completion shall be achieved when the TISC successfully tests all software components of the entire system through the performance of a full and detailed Factory Acceptance Test (FAT) under the supervision of, and with the participation of SRTA and/or SRTA's representatives.

Liquidated damages shall apply for failure to complete Factory Acceptance Test within 18 months of NTP or the number of Calendar Days committed to in the Master Project Schedule, whichever is less.

After the successful completion of the FAT, the Transition Phase may start.

#### 4.1.3.2 Phase B – Transition

Phase B: Transition may begin after the achievement of FAT Major Milestone, when the TISC shall have received full approval for the DDD and shall have accomplished a successful TFH and Roadside Factory Acceptance Test.

Phase B includes field equipment and software installation, TFH hardware and software installation, necessary testing activity and any other activities considered necessary to replace the existing toll systems and commission the TFH and all Roadside installations for both Facility Pairs.

Other Phase B activities shall include the development of additional reports and dashboards, design and software updates resulting from test failures, bug findings or any other reason, the preparation of As-Built reports and drawings, the deposit of the Software source code to an Escrow and the provision of training to SRTA personnel.

Further, as parts of the existing toll systems will be transitioned to the ETCS, the TISC will assume Operation and Maintenance responsibilities. These include image review when the TFH goes live for each

Facility Pair, maintenance of the TFH and Maintenance of Roadside installations as they are transitioned to the ETCS.

Phase B is milestone-dependent, and completion is based on receipt by the TISC of the Final System Acceptance notice.

Liquidated damages shall apply for failure to receive the Final System Acceptance notice within 54 months of NTP or the number of Calendar Days committed to in the Master Project Schedule, whichever is less.

#### 4.1.3.3 Phase C – Operation and Maintenance

Phase C shall begin after the TISC receives the Final System Acceptance notice. It shall include the provision of operation services and full maintenance and system support by the TISC for a period as defined in the Contract (Attachment 2: Contract).

The services shall include image review, TFH hosting and maintenance, Roadside maintenance and software maintenance including timely and consistent source code upgrades in the Escrow.

Phase II shall further include a Continuous Improvement Program and upon notification by SRTA, the provision of services for phasing out and transitioning the ETCS to a succeeding System/ Contractor prior to conclusion of the TISC Contract.

Phase III is time bound and completion is based upon reaching the end date of the Project. Phase III may at the sole discretion of SRTA be extended according to the relevant provisions of the Contract (Attachment 2: Contract). In such case, the end date of the Contract and Major Milestone C shall be adjusted accordingly.

## 4.2 TISC Organization and Staffing

The TISC shall assign, and maintain at all times, sufficient, qualified and experienced personnel to deliver, operate, and maintain the Project according to the schedule and at the quality defined in this RFP and the Contract.

The following requirements shall apply without exception to all TISC staff and all TISC subcontractors' staff:

No.	Requirement
	The TISC shall provide properly trained and certified personnel to perform the work.
	The TISC shall conduct security background checks in accordance with SRTA's standards on all TISC personnel assigned to the Project.
	All TISC personnel shall wear SRTA-issued identification badges when performing duties on the Project in the field and/or SRTA roadways or within GDOT and SRTA facilities.

### 4.2.1 Key Staff

The following roles shall be considered TISC's key personnel for the Project:

1. Project Director.
2. Project Manager.



3. Deputy Project Manager.
4. Technical Delivery Manager.
5. TFH Operations Liaison.
6. Operations and Maintenance Manager.

Key Personnel shall be directly employed by the TISC. In case the TISC wants to use subcontractor's personnel for a key role, explicit approval by SRTA shall be required. The Project Director and the Project Manager positions shall not be assigned to subcontractors.

The general requirements for Key Staff are as follows:

No.	Requirement
	The TISC shall provide to SRTA direct access to all key personnel as determined necessary by SRTA.
	Changes to the key personnel identified in the organization chart shall be submitted in writing to SRTA for approval 30 days prior to the person's start in a new position or reallocation.
	Changes to the key personnel identified in the organization chart because of resignation or termination shall be submitted in writing to SRTA upon official notification of resignation or termination.
	The TISC shall assign and maintain at all times sufficiently qualified and experienced personnel to deliver, operate and maintain the Project.
	The TISC shall provide all technical staff and services as required in this RFP to provide the ETCS system within the approved Master Project Schedule.
	Upon SRTA's request, the TISC shall remove and replace the Project Manager, or any other member of the TISC's team, if the team member fails to perform the required Contract work including failure to respond to emails, phone calls, or requests for meetings; failure to complete project document updates as required; repeatedly missing deadlines for reasons not related to the project activities.
	Any proposed changes to any key personnel shall be submitted in writing for approval to SRTA before the change is implemented along with the anticipated timeline and plan for the transition in the TISC and TISC subcontractor's responsibilities.

#### 4.2.1.1 Project Manager

The requirements for the Project Manager are as follows:

No.	Requirement
	The TISC Project Manager shall be PMP certified as defined by the Project Management Institute with a minimum of seven (7) years' experience as a Project Manager or alternatively have experience as a Project Manager for a minimum of ten (10) years.
	The TISC Project Manager shall have experience as a Project Manager with at least one (1) ETCS system that includes Express Lanes currently in revenue production.

No.	Requirement
	The Project Manager shall be dedicated full time to the Project through successful completion of Final System Acceptance of both I-75 and I-85 Facility Pairs and as-needed thereafter through the Term of the Contract.
	The Project Manager shall be the primary point of contact for the Project.

#### 4.2.1.2 Deputy Project Manager

The requirements for the Deputy Project Manager are as follows:

No.	Requirement
	The TISC Deputy Project Manager shall have experience as a Project or Technical Lead for a minimum of four (4) years with at least one (1) ETCS system that includes Express Lanes that is currently in revenue production.
	The Deputy Project Manager shall be dedicated full time to the Project through successful award of Final System Acceptance, and as-needed thereafter through the Term of the Contract.
	The Deputy Project Manager shall be the primary point of contact for the Project if and when the Project Manager is not available.

#### 4.2.1.3 Technical Delivery Manager

SRTA requires technical leadership staff to be dedicated to the Project throughout the System Design and Development phase for the Project.

The requirements for the Technical Delivery Manager are as follows:

No.	Requirement
	The TISC shall provide a dedicated Technical Delivery Manager who is overall responsible for all technical aspects of the ETCS system starting at Notice of Award and throughout the subsequent phases of the Project.
	The TISC Technical Delivery Manager shall be dedicated full time to the Project through successful award of Final System Acceptance.
	The TISC Technical Delivery Manager shall have experience as a Technical Delivery Manager for a minimum of five (5) years with at least one (1) Toll system that includes Express Lanes that is currently in revenue production.

#### 4.2.1.4 TFH Operations Liaison

The TFH Operations Liaison shall be responsible to facilitate communication and transfer information between SRTA TFH Operations and the TISC. The requirements for the TFH Operations Liaison are as follows:

No.	Requirement
	The TFH Operations Liaison shall have at least three (3) years of hands-on experience with a TFH solution applied in a production toll system.
	<p>The TFH Operations Liaison shall:</p> <ol style="list-style-type: none"> <li>1. Perform as the single Point of Contact to SRTA Operations for the TFH.</li> <li>2. Have prior experience and detailed knowledge of the TISC-provided TFH.</li> <li>3. Assist with training SRTA staff.</li> <li>4. Create ad-hoc reporting and notifications as requested by SRTA.</li> <li>5. Report on-site at SRTA HQ during normal business hours.</li> <li>6. Provide on-site assistance with the understanding and/or use of all aspects of the TISC-provided TFH solution.</li> <li>7. Assist with troubleshooting and identification of root cause of system issues.</li> <li>8. Arrange access to the TISC SMEs as needed and/or as requested by SRTA.</li> <li>9. Perform as the liaison to SRTA network team as needed.</li> <li>10. Provide recommendations to the TISC and SRTA for continuous improvement for the operation of the TISC-provided system based on feedback and experiences with SRTA HQ personnel.</li> </ol>
	The TISC shall receive SRTA approval of the proposed TFH Operations Liaison candidate(s) prior to assigning the individual to perform on the Contract.
	The TISC TFH Operations Liaison shall join the TISC/SRTA team at TFH FAT and be on-site at SRTA HQ thereafter through the Term of the Contract.
	The TFH Operations Liaison shall be fully dedicated to the Project from the beginning of FAT execution through the Term of the Contract.
	The TFH Operations Liaison shall report primarily to SRTA's office in Atlanta, GA region after the completion of FAT through the Term of the Contract.

#### 4.2.1.5 Operation and Maintenance Manager

The Operation and Maintenance Manager shall be responsible to lead and manage all Operation and Maintenance activities during the term of the contract. The requirements for the Operation and Maintenance Manager are as follows:

No.	Requirement
	The TISC Operation and Maintenance Manager shall have at least five (5) years of experience in the operation and maintenance of toll systems with a minimum of two (2) years in operating and maintaining a Managed Lanes toll system.
	The TISC Operation and Maintenance Manager shall be engaged from the early stages of the project (during Preliminary Design) in order to provide input related to operational issues and maintainability of the ETCS.
	The TISC Operation and Maintenance Manager shall be assigned full time to the Project from the time when the first Facility Pair successfully passes the RRT through the Term of the Contract.

No.	Requirement
	The TISC Operation and Maintenance Manager shall reside in the Atlanta, GA region from the time when the first Facility Pair successfully passes the RRT through the Term of the Contract.

#### 4.2.2 Mandatory Positions

Besides Key Staff, the TISC shall include and occupy in the Project Organization the following mandatory positions:

1. QA/QC Manager.
2. Health and Safety Manager.
3. Documentation Manager.
4. Information Security Manager.
5. Test Director.
6. Training Director.
7. Software Architect.
8. Business Analyst.
9. UX Lead.
10. Roadside Architect.
11. Network Manager.
12. Installation Manager.

The general requirements for mandatory positions staffing are as follows:

No.	Requirement
	Changes to the occupation of mandatory positions shall be submitted in writing for approval by SRTA 30 days prior to the person's start in a new position or reallocation.
	Changes to the occupation of mandatory positions because of resignation or termination shall be submitted in writing to SRTA upon official notification of resignation or termination.
	The TISC shall assign and maintain at all times sufficiently qualified and experienced personnel to deliver, operate and maintain the Project.

##### 4.2.2.1 QA/QC Manager

The QA/QC Manager shall be responsible for the overall planning, implementation, and audit of a quality assurance program for the Project. The requirements for the QA/QC Manager are as follows:

No.	Requirement
	The TISC QA/QC Manager shall have experience as a QA/QC Manager for a minimum of five (5) years.
	The TISC QA/QC Manager shall only fill the role of QA/QC Manager on the Project.
	The QA/QC Manager shall report at an organizational level above the TISC's Project Manager, or outside of the Project Manager's direct staff.
	The QA/QC Manager shall be identified on the organization chart by name and relationship to the TISC Project Manager within the corporation management structure.
	The TISC QA/QC Manager position shall be occupied during the entire term of the Project.
	The TISC QA/QC Manager may not be full-time on the Project but shall dedicate adequate time to fulfill their duties according to this RFP and the Contract.
	The QA/QC Manager shall report directly to the Project Manager or Deputy Project Manager.

#### 4.2.2.2 Health and Safety Manager

The Health and Safety Manager shall be responsible for the overall planning, implementation, and audit of a health and safety program for the project. The requirements for the Health and Safety Manager are as follows:

No.	Requirement
	The TISC Health and Safety Manager shall have experience as a Health and Safety Manager for a minimum of five (5) years in total, with three (3) of them in highway projects.
	The TISC Health and Safety Manager shall have taken relevant OSHA training and be OSHA certified as a Health and Safety specialist.
	The Health and Safety Manager shall only fill the role of Health and Safety Manager on the Project.
	The Health and Safety Manager position shall be occupied during the entire term of the Project.
	The TISC Health and Safety Manager may not be full-time on the Project but shall dedicate adequate time to fulfill their duties according to this RFP and the Contract.
	The Health and Safety Manager shall report directly to the Project Manager or Deputy Project Manager.

#### 4.2.2.3 Documentation Manager

The Documentation Manager shall be responsible for overseeing the proper implementation of the document management processes as described in the Document Management Plan. The requirements for the Documentation Manager are as follows:

No.	Requirement
	The TISC Documentation Manager shall have experience as a Documentation Manager for a minimum of five (5) years in a similar position.

No.	Requirement
	The TISC Documentation Manager shall only fill the role of Documentation Manager on the Project.
	The TISC Documentation Manager position shall be occupied during the entire term of the Project.
	The TISC Documentation Manager shall be dedicated full time to the Project through successful award of Final System Acceptance, and as-needed thereafter through the Term of the Contract, always in full compliance with the requirements of this RFP and the Contract.
	The TISC Documentation Manager shall report directly to the Project Manager or Deputy Project Manager.

#### 4.2.2.4 Information Security Manager

The requirements for the Information Security Manager are as follows:

No.	Requirement
	<p>The TISC shall designate a specific TISC employee with the qualifications listed below to perform the role of Information Security Manager for the duration of the Contract.</p> <ol style="list-style-type: none"> <li>11. Degree in computer science or a technology-related field.</li> <li>12. Obtain or have a Professional information security certification (CISSP, CISA, CISM, CEH, GSEC, SSCP, CASP, GCIH or OSCP).</li> <li>13. 3-5 years' experience in an information security role.</li> <li>14. Solid knowledge of various information security frameworks.</li> <li>15. Excellent problem-solving and analytical skills.</li> <li>16. Ability to educate a non-technical audience about various security measures.</li> <li>17. Effective verbal and written communication skills.</li> </ol>
	The TISC Information Security Manager shall perform as the single point of contact for issues related to information security of the ETCS for the duration of the Contract.
	The TISC Information Security Manager shall implement an information security awareness and training program which includes quarterly training/testing of TISC personnel and/or subcontractors who support or have access to ETCS systems.
	The Information Security Manager shall ensure all project staff from TISC personnel and/or subcontractors complete this training within 30 days of NTP or within 30 days of hire.
	The Information Security Manager shall maintain records documenting completion of training and provide these records to SRTA upon request.
	The Information Security Manager may not be full-time on the Project but shall dedicate adequate time to fulfill their duties according to this RFP and the Contract.
	The TISC Information Security Manager shall report directly to the Project Manager or Deputy Project Manager.

#### 4.2.2.5 Test Director

The TISC shall provide a dedicated Test Director who shall be responsible for the overall planning and implementation of the test program for the Project. The requirements for the Test Director are as follows:

No.	Requirement
	The TISC Test Director shall have experience as a Test Director for a minimum of five (5) years with at least two (2) ETCS currently in revenue production.
	The Test Director shall only fill the role of Test Director on the Project.
	The TISC Test Director shall be dedicated full time to the Project from submission of the Mater Test Plan through successful award of Final System Acceptance, and as-needed before and thereafter through the Term of the Contract, always in full compliance with the requirements of this RFP and the Contract.
	The Test Director shall report directly to the project Manager or Deputy Project Manager.

#### 4.2.2.6 Training Director

The Training Director shall be responsible for the overall planning, preparation, and execution of the training program for the Project. The requirements for the Training Director are as follows:

No.	Requirement
	The TISC shall provide a dedicated Training Director who is responsible for all planning and implementation of all test phases for the Project. The Test Director shall only fill the role of Test Director on the Project.
	The TISC Training Director shall have experience as a Training Director for a minimum of three (3) years.
	The TISC Training Director shall be engaged full-time on the Project during preparation and execution of the training program, and if and as needed before or thereafter through the Term of the Contract.
	The Training Director shall report directly to the project Manager or Deputy Project Manager.

#### 4.2.2.7 Software Architect

The Software Architect shall be responsible for the overall design and development of the ETCS Software. The requirements for the Software Architect are as follows:

No.	Requirement
	The TISC shall provide a dedicated Software Architect responsible for the design and the development of the TFH and the ETCS roadside systems software.
	The TISC Software Architect shall have experience as a Software Architect for a minimum of five (5) years with at least three (3) years in Express Lanes toll system software design and development.

No.	Requirement
	The TISC Software Architect shall be full time on the Project through full approval of DDD and successful FAT execution and as needed thereafter until successful award of Final System Acceptance.
	The Software Architect shall report directly to the Technical Delivery Manager.

#### 4.2.2.8 Business Analyst

The Business Analyst shall be responsible for analyzing and reflecting SRTA's business rules to the ETCS Software. The requirements for the Business Analyst are as follows:

No.	Requirement
	The TISC shall provide a Business Analyst responsible for the analysis and transition of SRTA's business rules into ETCS software functionality.
	The TISC Business Analyst shall have experience as a Business Analyst for a minimum of five (5) years.
	The TISC Business Analyst shall be on the Project through successful completion of FAT and as needed thereafter until successful award of Final System Acceptance.
	The Business Analyst shall report directly to the Technical Delivery Manager.

#### 4.2.2.9 UX Lead

The UX Lead shall be responsible for supporting the TISC software development team in creating a user experience fully compatible with SRTA's expectations. The requirements for the Software Architect are as follows:

No.	Requirement
	The TISC shall provide a dedicated UX Lead responsible for the transition of the user experience envisioned by SRTA into ETCS user interface functionality.
	The TISC UX Lead shall have experience as a user interface specialist for a minimum of three (3) years.
	The TISC UX Lead shall be on the Project through successful completion of FAT and as needed thereafter until successful award of Final System Acceptance.
	The UX Lead shall report directly to the Software Architect.

#### 4.2.2.10 Roadside Architect

The Roadside Architect shall be responsible for the design of the ETCS Roadside installations. The requirements for the Roadside Architect are as follows:



No.	Requirement
	The TISC shall provide a dedicated Roadside Architect responsible for the technical design of the ETCS roadside systems.
	The TISC Roadside Architect shall have experience as a Roadside Architect for a minimum of 5 years with at least one (1) Toll system that includes Express Lanes that is currently in revenue production.
	The TISC Roadside Architect shall be on the Project through successful award of Final System Acceptance and as needed thereafter during the Term of the Contract.
	The Roadside Architect shall report directly to the Technical Delivery Manager.

#### 4.2.2.11 Network Manager

The Network Manager shall be responsible for the overall planning, implementation, and support of the communications network for the Project. The requirements for the Network Manager are as follows:

No.	Requirement
	The TISC shall provide a dedicated Network Manager who shall be responsible for all planning and implementation activity.
	The TISC Network Manager shall have experience as a Network Designer/ Manager for a minimum of six (6) years.
	The TISC Network Manager shall be full-time on the Project during the Transition Phase, and if and as needed before and thereafter through the Term of the Contract.
	The Network Manager shall report directly to the Technical Director.

#### 4.2.2.12 Installation Manager

The Installation Manager shall be responsible for the planning and execution of all installation activities of during the ETCS delivery. The requirements for the Installation Manager are as follows:

No.	Requirement
	The TISC shall provide a Installation manager who shall be responsible for the planning and execution of all installation tasks for the Project.
	The TISC Installation Manager shall have experience as an Installation Manager in a project of similar size and complexity for a minimum of three (3) years.
	The TISC Installation Manager shall be full-time on the Project during the Transition Phase, and if and as needed before and thereafter through the Term of the Contract.
	The TISC Installation Manager shall be available to be on site as necessary during the Transition Phase.
	The Installation Manager shall report directly to the Technical Director.

#### 4.2.3 TISC Subcontractors' Personnel

In case the TISC intends to engage subcontractors that shall be responsible for executing part of the scope of work and/or undertake key staff roles, the TISC shall maintain the same responsibility for the subcontractors' personnel as for the TISC own personnel.

No.	Requirement
	The TISC shall confirm in writing when the changes in responsibilities have been completed.
	The TISC shall conduct security background checks in accordance with SRTA's standards on all TISC sub-contractor personnel assigned to the Project.
	All TISC sub-contractor personnel shall wear SRTA-issued identification badges when performing duties on the Project in the field and/or SRTA roadways or within GDOT and SRTA facilities.

Additional requirements for the replacement of TISC key or mandatory positions personnel with Subcontractor's personnel and vice versa are as follows:

No.	Requirement
	All TISC requests for changes in responsibilities from the TISC to a subcontractor and vice versa shall be approved by SRTA no fewer than thirty (30) days prior to the actual changes in responsibilities occurring.
	All TISC requests for the replacement of TISC key or mandatory position personnel with Subcontractor's personnel and vice versa shall include the submission by the TISC and approval by SRTA of a detailed transition plan and timeline for the transitioning of responsibilities.
	The transition plan for the replacement of TISC key or mandatory position personnel with Subcontractors' personnel and vice versa shall communicate the following details, at a minimum: <ol style="list-style-type: none"><li>1. Organizational chart.</li><li>2. Scope of responsibilities.</li><li>3. Communication and coordination procedure.</li><li>4. Escalation matrix.</li><li>5. Schedule.</li><li>6. Logistics.</li><li>7. Risk matrix.</li></ol>
	The TISC shall confirm in writing when the replacement process and the changes in responsibilities have been completed.

#### 4.2.4 TISC Subcontractors

During the Term of the Contract, the TISC may want to terminate collaboration with subcontractors, introduce new subcontractors or replace subcontractors. For any of these actions the TISC shall obtain SRTA approval.

Requirements for this process are as follows:

No.	Requirement
	Any proposed changes to any subcontractors shall be submitted in writing to SRTA, along with the anticipated timeline and plan for the transition in the subcontractor's responsibilities.
	In case the collaboration with a subcontractor is terminated because the services provided are no longer needed, the TISC shall provide a justification report including a description of residual risks and how they shall be mitigated no fewer than thirty (30) days prior to the termination.
	In case a new subcontractor is introduced, the TISC shall request SRTA approval for the subcontractor, no fewer than thirty (30) days prior to its engagement in the Project, providing the following information as a minimum: <ol style="list-style-type: none"> <li>1. Organizational chart.</li> <li>2. Scope of responsibilities.</li> <li>3. Communication and coordination procedure.</li> <li>4. Escalation matrix.</li> <li>5. Schedule.</li> <li>6. Logistics.</li> <li>7. Risk matrix.</li> </ol>
	In case a subcontractor is replaced by another, in addition to the above requirements, the TISC shall provide: <ol style="list-style-type: none"> <li>1. Justification for the need for replacement.</li> <li>2. Proof that the new subcontractor can fulfil the role and undertake the full responsibilities of the departing subcontractor.</li> <li>3. A detailed transition plan.</li> <li>4. A timeline for the transitioning of responsibilities.</li> </ol>
	All TISC requests for changes in responsibilities from the TISC to a subcontractor and vice versa shall be approved by SRTA no fewer than fifteen (15) days prior to the actual changes in responsibilities occurring.
	The TISC shall confirm in writing when the departure, onboarding or replacement process has been completed, within five (5) days after completion.

## 4.3 Project Management

### 4.3.1 Project Management, Coordination and Delivery

The TISC shall perform ongoing project management to manage, monitor and track all project work activities against the approved baseline scope, schedule and budget.

Success in the Project will be realized through a highly effective team comprised not only of SRTA and TISC staff, but also all key stakeholders, to include SRTA Consultants, GDOT, GDOT Contractors, the existing Toll System Integrators, and others as identified by SRTA. Open, timely, and effective communications will be key to realizing success in these large ETCS tolling Project.

The general requirements for Project Management are as follows:

No.	Requirement
	The TISC shall provide the necessary resources (including staff and tools) to meet the specifications of this RFP.
	The TISC shall provide the necessary project controls and methods to meet the specifications of this RFP.
	The TISC project management approach shall be consistent with the latest version of the Project Management Body of Knowledge (PMBOK).
	The TISC shall work with SRTA to coordinate their installation and transition activities with GDOT, the GDOT Contractors, and the existing TSIs from design through Project completion.
	In the event of a conflict in coordinating allowable work hours for all activities within the Project limits, the TISC shall escalate the issue to the SRTA designee for resolution.
	The TISC shall coordinate with SRTA, GDOT, and GDOT maintenance staff on a regular basis to conduct activities within the ETCS facilities.

#### 4.3.2 Project Management Platform

SRTA utilizes a project management platform to manage projects which is currently built on MS SharePoint Online, MS Teams, and MS Project Online. The TISC is expected to manage and document all Project activities and tasks in SRTA's platform. SRTA shall maintain the platform and provide necessary access.

The requirements for the Project Management Platform include:

No.	Requirement
	The TISC shall manage and document all Project activities and tasks in SRTA's Project Management Platform (currently MS SharePoint / MS Teams), including but not limited to project schedules, risks and issues, project status, progress reports, action items, meeting agendas/notes, and contract documents including amendments and change orders.
	The TISC shall store and maintain all correspondence, project documents, project plans, and deliverables in SRTA's Project Management Platform.
	The TISC shall maintain a library of all SRTA-approved Project documents for team reference in SRTA's Project Management Platform throughout the Contract.
	The TISC shall maintain the expertise and resources required to utilize SRTA's Project Management Platform for the duration of the Contract.
	The TISC shall be responsible for procuring all relevant software user licenses that are required for TISC and subcontractors' staff to access and use SRTA's Project Management Platform. These are subject to change at SRTA discretion and include but are not limited to Microsoft Office 365 and Microsoft Project Online.

#### 4.3.3 Project Management Plan

Through the Term of the Contract, the TISC will coordinate with SRTA, GDOT, and other entities and Project stakeholders as directed by SRTA, in support of the Project by executing a Project Management Plan (PMP).

The requirements for the PMP are as follows:

No.	Requirement
	Within the time defined in Appendix H: Deliverables' Schedule, the TISC shall submit a Project Management Plan (PMP) to SRTA for review and approval that describes how the TISC plans to manage and implement the Project described in this RFP.
	The PMP shall include details of how the TISC plans to manage each phase of the Project to include System Design, System Development, System Testing, Hyper-care Support (the heightened level of TISC support provided from TFH Go Live until System Acceptance of a facility pair), Operations, Warranty, and Maintenance for all toll facilities for the term of the Contract.
	The PMP shall include the TISC's approach to project management. The proposed management plan, philosophy and principles shall be consistent with the latest version of the Project Management Institute's PMBOK and compatible with SRTA's capabilities, policies and procedures.
	The PMP shall include a Performance Management Plan, including descriptions of the project management tools, staff, and measurable controls that will be utilized to meet the specifications of this RFP and will enable SRTA to monitor the progress and quality of the work performed on the Project.
	The PMP shall include a Stakeholders management and Engagement Plan that includes details of all key stakeholders and subcontractors and their roles and responsibilities for the Project.
	The PMP shall include a Communication Management Plan that describes the TISC's approach to communications management to define how team and stakeholder communication will be handled throughout the term of the contract for all Project phases.
	The PMP shall include an Issues Management Plan.
	The PMP shall include a Risk Management Plan.
	The PMP shall include a Change Management Plan. The Change Management Plan shall include the following elements: project and organizational strategy to manage changes, analysis of concerns and obstacles related to changes, communication of proposed changes, and approval process for changes.
	The TISC shall document changes to the system and the project through a formal change request process that describes the changes, priorities, and justifications, and the process for securing the appropriate approvals.
	The TISC shall provide procedures as part of the Change Management Plan which define how changes to system requirements, design, or training documentation will be updated, so all documents remain current for the life of the Contract. This includes the methodology for SRTA approving the documentation updates

No.	Requirement
	The TISC shall document changes to the system and the project through a formal change request process that describes the changes, priorities, and justifications, and the process for securing the appropriate approvals.
	The PMP shall include a Document Management Plan.
	The PMP shall include the Project Schedule baseline and a Schedule Management Plan to describe the processes for managing any changes/deviations from the baseline Project Schedule.
	The PMP shall include a Scope Management Plan to describe the processes for managing any changes/deviations from the baseline Project Scope.
	The PMP shall include the Project Cost baseline and a Cost Management Plan to describe the processes for managing any changes/deviations from the baseline Project Cost.
	The TISC shall update the PMP at least annually and as often as needed to reflect any applicable changes during the Term of the Contract.
	The PMP shall include a Requirements Management Plan defining how the TISC will coordinate with SRTA and SRTA's designees to meet all the requirements as set forth in this RFP.
	The PMP shall include how the TISC will coordinate with the existing TSIs to successfully transition the existing TSI roadside tolling systems as set forth in this RFP.
	The PMP shall include an organization chart(s) listing key personnel and at least one level below key personnel together with their roles and responsibilities.
	The TISC shall identify any key personnel and their roles and responsibilities in the PMP.
	The PMP shall include categories of work that will be performed by the TISC's own personnel and those categories that will be performed by subcontractors.
	For all key personnel, subcontractors, and Teaming Partners, the PMP shall include a key project staff directory that includes the following information for each person listed: Name, Title (with respect to the project), Project role, years of relevant experience, primary project contact, primary location (Atlanta or otherwise), email address, cell phone number, when they will be in Atlanta for each phase of the Project, and the percentage of time they will be dedicated to the Project.
	The key project staff directory shall be updated as needed throughout the term of the Project.

#### 4.3.3.1 Communications Plan

The TISC is responsible for effective communications with all key stakeholders of the Project throughout the Term of the Contract. This includes, but is not limited to, communications with SRTA, GDOT, the Civil Developer, the existing Toll System Integrators, the existing Backoffice integrator, and any other entities identified by SRTA or the TISC as necessary for project success.

The TISC shall develop a Communications Management Plan to define and describe the communications management process.

The requirements for communications management are as follows:

No.	Requirement
	The Communications Management Plan shall include a detailed description of the methods (e.g., telephone, email, video chat, discussion forum, collaboration tool) the TISC will employ to communicate the management of their plans, procedures, tools, and techniques to SRTA and SRTA's designees, GDOT, the GDOT Contractors, legacy TSIs, existing Backoffice integrator, and any other key project stakeholders.
	The Communications Management Plan shall include detailed communications strategies for ensuring all TISC management and implementation teams communicate and collaborate frequently and effectively with SRTA, SRTA Network, Operations and IT teams, SRTA's designees, GDOT, GDOT Contractors, and existing TSI tolling system providers to ensure the entire TISC team is current and aware of all aspects of the Project.
	The Communications Management Plan shall describe protocols to be applied during in-person and virtual meetings concerning user appearance, behavior, etc.
	The Communication Management Plan shall include an Escalation Plan.

#### 4.3.3.1.1 Escalation Process

The Communications Management Plan shall also include an Escalation Plan describing the escalation process. The purpose of the escalation process is to provide a method for Project issues that require additional oversight and input for resolution to be brought to the attention of Senior members of both SRTA and the TISC organization for rapid resolution. This process is to be a precursor to any performance, cure, and/or escalation process defined in the TISC contract. The process must facilitate rapid escalation to appropriate personnel with experience, knowledge, and authority to assist with Project issue resolution. During an escalation, the TISC and SRTA are to provide direct access to SMEs with the skills and experiences necessary to assist with resolution of the escalated issue(s).

The requirements for the escalation process are as follows:

No.	Requirement
	The TISC shall provide an Escalation Plan that defines the escalation process to be used for the Project throughout the Term of the Contract.
	The TISC Escalation Plan shall include an escalation matrix with escalation Points of Contact from the TISC Executive team by name and title and by project phase.
	The escalation matrix shall include which Project issues are to be raised to whom and within what timeframe.
	The Escalation Plan shall describe the different levels of escalation expected: <ol style="list-style-type: none"> <li>1. Project Management.</li> <li>2. Senior Management.</li> <li>3. Executive Sponsor/Director.</li> </ol>
	Escalated issues shall be monitored and updated daily until closure.
	The TISC shall work with SRTA to define and approve the Escalation Plan.
	The Escalation Plan shall describe the method for ensuring the escalation point of contact remain actively involved in and knowledgeable of the Project throughout the Contract term.
	The TISC shall adhere to the escalation process throughout the term of the Contract.

No.	Requirement
	The TISC shall continue addressing an escalated issue until SRTA confirms the issue has been resolved.

#### 4.3.3.2 Issues Management

SRTA requires a consistent and efficient issues management process. The process must enable the project team to quickly identify and vet Project issues for rapid resolution and/or advancement to the Project-approved escalation process.

The TISC shall develop an Issues Management Plan to define and describe the issues management process.

The requirements for issues management are as follows:

No.	Requirement
	The PMP shall include an issues management process describing how the TISC will work with SRTA to discuss and resolve system or Project issues.
	When an issue is identified or detected, the TISC shall immediately: 1) report it to SRTA along with any available details; 2) log it to the issue log.
	The TISC shall maintain a detailed issues log and tracking system from the beginning of the project until Final System Acceptance. Following Final System Acceptance, issues tracking shall be managed by the MOMS.
	The issue log shall include all identified issues for any software, hardware or service within the scope of this project, or any issue that impacts the Project.
	The issue log shall include issues that are the responsibility of the TISC to correct and issues which are the responsibility of SRTA or other third parties under SRTA's or the TISC's direction.
	The issue log shall also record the approach to resolving the issue, the owner of the issue, current status of the issue, any corrective action taken, the date and time of such action, and target resolution date.
	The issue log shall be stored and maintained in SRTA's project management platform and will be kept up to date at all times by the TISC.
	The issue management process shall be used to establish a structured means to track issues, trigger escalation when escalation conditions are met, ensure timely resolution of questions, roadblocks and issues, and document and identify possible changes to create change orders, when required.
	The TISC shall follow the issues management process to document, describe, and resolve Project issues throughout the Term of the Contract.

#### 4.3.3.3 Risk Management

Project risks shall be identified, managed and mitigated in an organized manner. The TISC shall develop a Risk Management Plan to define and describe the risk management process.

The requirements for risk management are as follows:



No.	Requirement
	The TISC shall describe in the PMP the risk management process that will be implemented to identify, track, and mitigate project risks.
	<p>The risk management process shall track the following factors, at a minimum, throughout the term of the Contract:</p> <ol style="list-style-type: none"> <li>1. Events subject to risk.</li> <li>2. Probability of risk.</li> <li>3. Impact to Project.</li> <li>4. Mitigation plan.</li> <li>5. Contingency plan.</li> <li>6. Reduction strategy.</li> </ol>
	The risk management process shall include the submission of a risk matrix/register to be submitted with the monthly project status report for all project risks.
	The TISC shall include in the risk matrix/register any potential delays in completing any task in the critical path as identified in the project schedule.
	The TISC shall execute all risk mitigation strategies as approved by SRTA.
	The risk log shall be stored and maintained in SRTA's project management platform and will be kept up to date at all times by the TISC.

#### 4.3.3.4 Document Management

The TISC is expected to use a document management system to support the document management processes detailed in the Document Management Plan for all electronic and hard copy documentation developed by the TISC for the Project and /or exchanged between SRTA and the TISC. All documentation provided by the TISC for the Project will be the property of SRTA.

The requirements for document management are as follows:

No.	Requirement
	The TISC shall provide deliverable documents according to the schedule included in Appendix H: Deliverables' Schedule and obtain SRTA approval before any deviation from the specified delivery dates.
	All documentation submittals shall be made to SRTA's repository in SRTA's Project Management Platform (Currently MS SharePoint and MS Teams).
	SRTA may, at its sole discretion, provide expedited review comments on any deliverable document if the TISC fails to deliver the document by the schedule due date. SRTA reserves the right to deem any such expedited comments as an official or a courtesy (unofficial) review.
	The TISC may utilize and maintain its own documentation management platform. In such case SRTA's personnel involved in the Project shall be provided with access to the TISC's platform and be trained to use it.
	The PMP shall include a description of the document management process, including, but not limited to:

No.	Requirement
	<ol style="list-style-type: none"> <li>1. Documentation management platform software utilized by the TISC (if the TISC chooses to utilize a platform different from SRTA's Project Management Platform).</li> <li>2. Format of TISC documentation.</li> <li>3. Process for delivering documentation to SRTA's Project Management Platform.</li> <li>4. Process for reviewing, revising, and approving documentation.</li> <li>5. Method of version control.</li> </ol>
	The TISC shall maintain a document management system to control all Project-related documents and drawings.
	The TISC shall develop the document naming convention to be used for all Project-related documents and drawings.
	The naming convention proposed by the TISC shall be coordinated with the SRTA PM and may include date created, date updated, revision number, and version number and shall incorporate signature blocks and approvals.
	The TISC shall title each Project-related document or drawing based on the naming convention.
	All documents with a table of contents shall hyperlink the sections listed in the table of contents so that the document navigates to the section when its respective table of contents entry is clicked.
	The TISC shall update the library of SRTA-approved Project documents with all revised and SRTA-approved Project documents throughout the Contract.
	<p>The TISC's document management system shall identify, categorize, code/label/name, track and manage the following:</p> <ol style="list-style-type: none"> <li>1. Project requirements.</li> <li>2. Project plans.</li> <li>3. Project design documentation.</li> <li>4. Project manuals.</li> <li>5. Project drawings.</li> <li>6. Project correspondence.</li> <li>7. Project memorandums.</li> <li>8. TISC subcontracts for the Project.</li> <li>9. Any other Project documents under the TISC's control.</li> </ol>
	The TISC shall designate an individual in their organization as the person responsible for overseeing the document management process which includes keeping all Project documents current for the term of the contract.

#### 4.3.4 Project Management Meetings

SRTA expects the TISC to conduct and participate in a series of meetings necessary to efficiently manage the Project. Those shall include regular executive and project management meetings.

##### 4.3.4.1 Monthly Project Management Meetings

The requirements for the Monthly Project Management Meetings are as follows:

No.	Requirement
	The TISC shall conduct Monthly Project Management Meetings to provide project status and explain the progress made during the reporting period and identify upcoming critical activities and milestones.
	Monthly Project Management Meetings shall be held in person in Atlanta, GA, at SRTA offices unless otherwise approved by SRTA.
	Either the TISC Project Manager or the TISC Deputy Project Manager shall be present in all Monthly Project Management Meetings.
	The TISC shall ensure that key personnel and decision makers attend the Monthly Project Management Meeting.
	The TISC shall submit a progress report to SRTA at least three (3) business days prior to the scheduled Monthly Project Management Meeting.
	The TISC shall submit a meeting agenda to SRTA at least three (3) business days prior to the scheduled Monthly Project Management Meeting.
	<p>The progress report and agenda for the Monthly Project Management Meeting shall include the following, at a minimum:</p> <ol style="list-style-type: none"> <li>1. Project status dashboard, including: Reporting date or period, Project phase (planning, design, development, testing, roll out), Project health indicators (overall, scope, budget, schedule), Budget snapshot (original contract value, total value of change orders, budget to date, actuals to date, Committed costs, LDs accrued to date if any, remaining balance), Schedule snapshot, KPIs (EV, PV, AC, BAC, SV, CV, SPI, CPI), milestones met, remaining milestones with estimated completion dates, overdue tasks, upcoming tasks and milestones, most important issues and risks. The project status dashboard will reside in SRTA's Project Management Platform and will be maintained and kept updated by the TISC.</li> <li>2. Updated Master Project Schedule and Project Status Report showing progress since the previous meeting and including any proposed changes from the latest approved Master Project Schedule.</li> <li>3. List of all SRTA resources required for any task, test, milestone, meeting, etc. for 4-week look ahead.</li> <li>4. Document Deliverables Status.</li> <li>5. Risk register changes including associated recommended mitigation/resolution strategies or contingency plans intended to avoid potential delays.</li> <li>6. List of open Project issues (if any) and their status.</li> <li>7. Report on testing activities including status and overview of defect tracking results (when applicable).</li> <li>8. Description of any pending and proposed change orders.</li> <li>9. Status of all change order work in progress.</li> <li>10. Accomplishments during the reporting period.</li> <li>11. Goals for the next reporting period.</li> <li>12. 6-week look ahead work plan for activities to be accomplished on the Project.</li> <li>13. Updated action items log.</li> <li>14. Status of open action items.</li> </ol>

No.	Requirement
	15. Justification for action items that can be closed. 16. New action items. 17. Copy of the approved final minutes of the previous meeting.
	The TISC shall prepare Monthly Project Management Meeting agendas in coordination with the SRTA Project Manager.
	TISC shall support other project specific meetings upon request by SRTA.
	The TISC shall coordinate date and time of project meetings with the SRTA Project Manager.
	The TISC shall prepare draft minutes of Monthly Project Management Meeting to include decisions and actions items noted. The TISC shall record meeting minutes, decisions and actions in SRTA's Project Management Platform.
	The TISC shall submit draft minutes of Monthly Project Management Meeting to the SRTA Project Manager within three (3) business days after the meeting.
	Once approved, the TISC shall post all Monthly Project Management Meeting minutes, materials and notes on SRTA's Project Management Platform.
	The TISC shall hold project meetings at SRTA's HQ or via video/teleconference as coordinated with the SRTA Project Manager.

#### 4.3.4.2 Quarterly Executive Meetings

The requirements for the Quarterly Executive Meetings are as follows:

No.	Requirement
	The TISC shall conduct Quarterly Executive Meetings to discuss the following, at a minimum: <ol style="list-style-type: none"> <li>1. Project progress and updates.</li> <li>2. Review overall Project timeline.</li> <li>3. Review issues/risks and their corresponding corrective/mitigation plans.</li> </ol>
	Quarterly Executive Meetings shall be held in person in Atlanta, GA, at SRTA offices. At SRTA 's discretion some Quarterly Executive Meetings may be held as remote video calls.
	SRTA, the TISC Project Director, the TISC Project Manager and/or the TISC Deputy Project Manager shall participate in person at the on-site Quarterly Executive Meetings.
	The TISC shall submit a meeting agenda to SRTA at least five (5) business days prior to the scheduled Quarterly Executive Meeting.

#### 4.3.5 Action Items Log

An action item log is required to manage all defined Project action items through the term of the Contract. The identification and prioritization of action items will be a coordinated effort between the TISC and SRTA. The requirements for the action item log are as follows:

No.	Requirement
	The TISC shall submit for SRTA's review and approval the process and format for action item tracking.
	The TISC shall maintain a log of all identified Project action items in SRTA's Project Management Platform.
	The TISC shall receive SRTA's concurrence and confirmation of availability before assigning any action item to SRTA resources.
	At a minimum, each action item in the log shall contain the following: <ol style="list-style-type: none"> <li>1. Action Item Number.</li> <li>2. Description.</li> <li>3. Priority.</li> <li>4. Responsible Party.</li> <li>5. Due Date.</li> <li>6. Status (open/closed/in progress/deferred etc.).</li> <li>7. Date Opened.</li> <li>8. Date Completed.</li> <li>9. Notes.</li> </ol>
	The TISC shall track all action items in the action log for all responsible parties until resolution.

#### 4.3.6 Document Submittal, Review and Approval

The TISC is required to submit to SRTA all documentation listed in Appendix H: Deliverables Schedule and any other documents necessary to complete the Project as defined in this RFP.

In addition to the documentation that will be produced by the TISC, the TISC will be asked to review and comment on numerous documents throughout the Project prepared by SRTA, SRTA contractors, GDOT, GDOT contractors, and other entities. The TISC is expected to cooperate fully with such requests and to provide the SME resources required to conduct a quality review of these documents in a timely manner.

The requirements for submittal, review and approval of documents are as follows:

No.	Requirement
	The TISC shall submit all Project Documentation to SRTA for review, comment, and approval. Incomplete and/or poor-quality submittals will be rejected before formal review is conducted.
	The TISC shall provide, at any one time, no more than three (3) documents to SRTA for review and approval. This includes any documentation deliverables previously submitted that require additional reviews. Every 100 pages of documentation, not including table of contents, counts as one document. For example, a document with 150 pages will be counted as two documents.
	The TISC shall deliver each document or submittal no later than 5pm Atlanta time on the date it is due according to the approved Master Program Schedule or on the next business day if the due date falls on a weekend or holiday.
	The TISC shall consider a submittal as final only when SRTA has approved the submittal after all comments are resolved.

No.	Requirement
	The TISC shall maintain a spreadsheet to track status of all submittals.
	The TISC shall maintain the submittal spreadsheet in SRTA's Project Management Platform.
	The TISC shall update the submittal spreadsheet weekly with status for submittals to be delivered in the upcoming two weeks.
	The TISC shall update the submittal spreadsheet when submittals are sent to SRTA or when submittals are received from SRTA.
	Based upon SRTA comments, the TISC shall update submittals and furnish a revised document for concurrence review and SRTA approval.
	Draft and final submittals of Project documentation shall be delivered electronically via SRTA's Project Management Platform.
	The TISC shall deliver Project documents in a standard Microsoft Office application format which allows for red-lining and tracking changes and in searchable PDF format.
	The TISC shall submit all document revisions in a comment log along with the revised, red-lined documents indicating all changes/ additions.
	The TISC shall adhere to the SRTA deliverable due dates as described within Appendix H: Deliverables' Schedule <b>Error! Reference source not found..</b>
	The TISC shall provide SRTA review cycles of no fewer than ten (10) business days for most deliverables and no fewer than 15 business days for major documents such as requirements documentation (e.g., SRD), design documents, Interface Control Documents (ICDs), test plans including test procedures, and submittals over 100 pages.
	For all other submittals not included in Appendix H: Deliverables' Schedule, the TISC shall plan for up to fifteen (15) business days for SRTA review.
	For all submittals requiring engineering design review/approval (e.g., mounting bracket drawings), the TISC shall plan for sixty (60) business days for SRTA review as well as the GDOT review period.
	For submittals requiring GDOT review, the TISC shall plan for an additional 45 business days for the initial review with at least 2 weeks advance notification of the start of review.
	The TISC shall review and provide comments to submittals from the GDOT Contractor within five (5) Business Days.
	The TISC shall coordinate with SRTA to schedule collaborative review meetings for every deliverable document to resolve any comments and issues.

#### 4.3.7 Records Management

The TISC is required to maintain all project records and data for the Project. The requirements for records management are as follows:

No.	Requirement
	The TISC shall maintain all pertinent Project records and data for no less than five (5) years after the expiration of the Contract to include, at a minimum:

No.	Requirement
	<ol style="list-style-type: none"> <li>1. Records of emails.</li> <li>2. Meeting minutes.</li> <li>3. Design reviews and code walk throughs.</li> <li>4. Inspections.</li> <li>5. Test results</li> <li>6. Records pertaining to nonconforming material.</li> <li>7. Change order documentation.</li> <li>8. Audit results.</li> <li>9. Project management documentation.</li> <li>10. All other records related to the RFP and the Contract.</li> </ol>
	The TISC shall keep the required records and data current as defined by the State of Georgia Common Retention Schedule included in Attachment 6: Data Retention Guideline.
	The TISC shall provide this information to SRTA upon request and at the expiration of the Contract.

#### 4.3.8 Invoicing

The process for submitting monthly invoices will be determined after contract award and collaboratively between SRTA and the TISC. The invoicing process may change over time during the term of the Contract. The requirements for invoicing are as follows:

No.	Requirement
	The TISC shall coordinate with SRTA to schedule the meeting to finalize the invoicing process at least 30 days prior to the submission of the first invoice.
	<p>The TISC shall meet with SRTA to:</p> <ol style="list-style-type: none"> <li>1. Agree to the overall method and process of submission of monthly invoices.</li> <li>2. Determine the type and content of supporting documentation the TISC must submit with monthly invoices.</li> <li>3. Determine the invoice approval process.</li> <li>4. Assess and revise the invoicing process as necessary prior to Go Live of a toll facility pair.</li> </ol>

#### 4.4 Quality Assurance and Quality Control Program

The TISC is required to provide an effective Quality Assurance/Quality Control Program (QA/QC Program) for the Project.

##### 4.4.1 Quality Management Plan

The requirements of the Quality Management Plan (QMP) are as follows:

No.	Requirement
	The TISC shall submit for SRTA review, comment, and approval a Quality Management Plan (QMP) that documents the processes and procedures of the QA/QC Program.
	The QMP shall describe how the TISC ensures the QA/QC Program is used as an integral part of the Project.
	The QMP shall describe how quality will be defined, measured, and achieved for all Project deliverables and services for the Project.
	The QMP shall include the training approach for all TISC staff, subcontractors, and teaming partners to ensure all quality processes and procedures are adhered to.
	The QMP shall identify the QA/QC Manager assigned to the Project.
	The QMP shall list the roles, tasks, and responsibilities of the QA/QC Manager as well as all other QA/QC personnel.
	The QMP shall describe the audits, reviews, and verifications that will be performed to ensure: <ol style="list-style-type: none"> <li>1. The established system development and project management processes and procedures are being followed effectively.</li> <li>2. The exposures and risks to the current Project are identified and addressed.</li> <li>3. All hardware, software, equipment, and any other ETCS materials meet the requirements of this RFP.</li> </ol>
	The TISC shall establish and document within the QMP the procedures for the selection of qualified suppliers and subcontractors.
	The QMP shall describe how the TISC will protect all hardware, software, equipment, spares, and other items required by this RFP.
	The TISC shall detail the change control process as part of their QMP.
	This change control process shall include the analysis, procedures, and testing to be followed to ensure reports are not negatively impacted.
	The QMP shall describe the feedback and corrective action process.
	The TISC shall ensure all deliverables, tasks, and services provided for the Project adhere to the SRTA-approved QMP.
	The TISC shall update the QMP to reflect gaps or improvements in QA/QC procedures through the term of the Contract.

#### 4.4.2 QA/QC Activities

All QA/QC activities of the Project are to follow the requirements listed below. SRTA reserves the right to inspect all services or supplies at any time. For those not manufactured or performed within the TISC's facility, SRTA reserves the right to inspect all services or supplies at the subcontractor or vendor site.

The requirements for the QA/QC Activities are as follows:



No.	Requirement
	The TISC shall establish, maintain, and follow a Quality Assurance/Quality Control Program (QA/QC Program) to ensure conformance to requirements and to ensure quality delivery of all Project deliverables and tasks.
	All supplies, equipment, devices, hardware, software, and other services delivered as part of this Contract, whether manufactured or performed within the TISC's plant or at any other source, shall be controlled by the TISC at all points necessary to ensure conformance to the Contract specifications.
	The QA/QC Program shall focus on the prevention and early detection and correction of discrepancies.
	In taking corrective action on nonconformities, the QA/QC Manager shall attempt to find a solution that will prevent nonconformities from reoccurring.
	The TISC shall be responsible for the inspection and verification of in-process, final assembly, unit tests, and system tests of their supplied systems.
	The TISC shall be solely responsible to meet the requirements of this RFP regardless of any inspection or verification conducted by SRTA or SRTA's designates.
	The TISC shall be responsible for controlling the quality of the supplies and services provided.
	The TISC shall provide and deliver documented handling, storage, preservation, packaging, and shipping instructions to the appropriate parties, including the specification of any unique or special requirements.
	The QA/QC Program shall include a change control process for the Project.
	The change control process shall follow the procedures of SRTA's Change Control Board (CCB) included in Attachment 8: SRTA Change Control Process.
	<p>The TISC shall coordinate with SRTA's CCB, SME's, SRTA IT/Network, and/or external parties impacted by change(s) for all:</p> <ol style="list-style-type: none"> <li>1. System software.</li> <li>2. Hardware.</li> <li>3. Network updates.</li> <li>4. TISC managed subsystems.</li> <li>5. TISC managed communication networks.</li> </ol>
	For all changes that may affect the tolling system and end users once the system is in production and live traffic is using the facility, the TISC shall submit a Change Request Form (CRF) to the CCB for review and approval prior to the proposed changes.
	<p>The CRF shall include the following information:</p> <ol style="list-style-type: none"> <li>1. Change Request ID.</li> <li>2. Date Submitted.</li> <li>3. Change Requestor.</li> <li>4. Change Location.</li> <li>5. Configuration Item.</li> <li>6. Change Type.</li> <li>7. Reason for Change.</li> </ol>

No.	Requirement
	8. Priority Level. 9. Time frame of change and estimated time to complete. 10. End users, applications, modules, and hardware affected. 11. Description of change. 12. Monitoring/testing/verification after change implementation. 13. Roll back procedures.
	The TISC shall submit CRF's to SRTA for review and approval as per SRTA's then-current SOPs for preventative and emergency maintenance submission timelines.
	The TISC is responsible for communication of the start, end, or other intermediate actions of any approved changes being deployed.
	The TISC shall develop and maintain the CRF template.
	The TISC shall conduct an initial review of the CRF template with SRTA for approval prior to submitting the QMP for SRTA review, comment, and approval.
	The TISC shall provide a feedback and corrective action process used to collect, log, track, correct, and disposition quality concerns during all phases of the project.

#### 4.4.3 Change Control Board (CCB)

Required QA/QC activities include the need for a change control process. The change control process is to be governed by the SRTA Change Control Board (CCB). The purpose of this CCB is to coordinate among all team members to minimize system conflicts and impacts to SRTA Operations by any one party. This process also provides notification in advance of work being performed so all necessary parties are aware. A description of SRTA's CCB can be found in Attachment 8: SRTA Change Control Process.

#### 4.4.4 Control of Purchase Inspection and Verification

The TISC shall be responsible for ensuring that all supplies, components, development tools, assemblies, subassemblies, and services procured from sub-contractors and vendors, conform to the specifications of this Project as well as applicable legislative and regulatory requirements. The TISC responsibility includes the establishment of procedures for the selection of qualified suppliers. In selecting qualified suppliers, the TISC shall ensure that the sub-contractors and vendors control the quality of the supplies and services provided through the application of certified QA/QC processes and procedures.

#### 4.4.5 Handling Storage and Delivery

The TISC QA/QC Program shall provide for adequate, documented handling, storage preservation, packaging, and shipping instructions to protect the quality of products required by this RFP. Any unique or special requirements applicable to procured items shall be delineated in the procurement documents. All procurement documents shall be made available to the SRTA upon request.

Material Storage and Handling Requirements are listed below:

No.	Requirement
	Materials shall be stored in a weathertight enclosure, raised off the ground, so they are protected from sunlight, weather exposure, moisture and deterioration.

No.	Requirement
	Materials shall be protected during handling and application to prevent damage or contamination.
	TISC and its subcontractors shall comply with manufacturer's printed recommendations for handling of materials.

#### 4.4.6 Inspection at Subcontractor or Vendor Facilities

SRTA or a designated representative reserves the right to inspect, at the source, supplies or services not manufactured or performed within the TISC facility. SRTA inspection shall not constitute acceptance, nor shall it in any way replace the TISC inspection activity or relieve the TISC of the responsibility to furnish an acceptable end-product.

### 4.5 Safety and Security

#### 4.5.1 Safety Plan

The TISC shall develop a Safety Plan in order to ensure all processes and methods are properly documented, always applied and continuously improved to safeguard TISC personnel, TISC subcontractors' personnel and other stakeholders' personnel. Following are the requirements for the Safety Plan:

No.	Requirement
	The TISC shall develop a comprehensive Safety Plan that will be adhered to for the term of the Contract.
	The TISC shall submit the Safety Plan to SRTA for review, comment, and approval within 30 days of NTP.
	The Safety Plan shall describe the safety related procedures that will be instituted during all phases of the contract to ensure personal safety and compliance with all applicable State and federal laws, rules, regulations, and legislation including but not limited to OSHA, NECA, FHWA, MUTCD, and GDOT.
	The TISC shall ensure that all personnel, including SRTA staff and/or their designated representatives, working within SRTA toll facilities are trained on the safety program, prior to entrance to any work area.
	The TISC is responsible for the safety of the TISC personnel and the TISC Subcontractors' personnel.
	The Safety Plan shall be reviewed/updated semi-annually as needed and no less than annually.

#### 4.5.2 Traffic Control Plan

The TISC is responsible for all traffic control activities during installation, testing and commissioning, decommissioning, and maintenance. As such, the TISC is responsible for understanding the lane closure

restrictions for the travel lanes, shoulders, and ramps for the mainline and arterial roadways, as well as the coordination requirements with SRTA and GDOT.

Due to the overlapping roadway maintenance responsibilities between GDOT, SRTA, other local government agencies, and other entities, there may be competing priorities for access to the roadway. SRTA can prioritize lane closures through coordination with the TISC. All entities requiring lane closures in the State's highway system are required to submit a Traffic Interruption Request (TIR) to the Traffic Management Center (TMC) for review and approval prior to traffic control activities. A submitted TIR is not guaranteed to be approved.

This section details all the traffic control requirements that the TISC will need to adhere to during the term of the Contract.

No.	Requirement
	The TISC shall submit a Traffic Control Plan (TCP) including procedures that will be used for planning, implementing, and coordinating all lane closure types required to support the ETCS for the duration of the Contract.
	The TISC shall submit the Traffic Control Plan to SRTA for review and approval at least 60 days before the start of any roadside installation activities.
	The Traffic Control Plan shall be approved by SRTA prior to the start of any TISC activities that require lane closures.
	The TISC shall update the Traffic Control Plan annually, at a minimum, and at SRTA's request.
	The TISC Traffic Control Plan shall adhere to the requirements of this RFP, GDOT Standards and manuals, the Manual on Uniform Traffic Control Devices (MUTCD), and applicable laws, regulations, and codes.
	The TISC Traffic Control Plan for I-75 and I-85 shall adhere to GDOT's traffic control provisions found in Attachment 7: Traffic Control.
	For the I-75A and I-75B facilities, the TISC Traffic Control Plan shall adhere to the GDOT Access Guidelines for Reversible Express Lane Systems document found in Attachment 7: Traffic Control.
	<p>The TISC Traffic Control Plan shall include the following information, as applicable:</p> <ol style="list-style-type: none"> <li>1. Facility, road, location, and lanes to be closed/maintained.</li> <li>2. Reason for closure or maintenance activity.</li> <li>3. The procedures for coordination, communication, and notification with SRTA, GDOT, and other entities.</li> <li>4. The policies and procedures for scheduling lane closures.</li> <li>5. The proposed staffing for planning, installing, maintaining, and removing the traffic control equipment.</li> <li>6. Planned hours and duration of closure or maintenance.</li> <li>7. Safety measures, including signage, safety training, personnel safety equipment.</li> <li>8. Lane control resources required (e.g., cones, drums, police, etc.).</li> <li>9. Notifications.</li> <li>10. Clean-up and restoration required to re-open the lanes.</li> </ol>

No.	Requirement
	The TISC shall provide all traffic control equipment required to conduct any traffic control activities.
	The Traffic Control Plan shall identify the point(s) of contact responsible for any traffic control activities and provide the name, cell phone number, and email address for each contact.
	The Traffic Control Plan shall include an organizational chart showing the chain of escalation for any traffic control issues.
	The Traffic Control Plan shall include contingency procedures for removal of the traffic control equipment due to weather conditions or other conditions that require the removal of the lane closure.
	In the event traffic control inspections are required relative to any lane closures, the TISC shall be responsible for all costs associated with the inspection.
	For any planned work that requires lane closures, the TISC shall work within the identified traffic control work zone.
	The TISC shall assign a point of contact to be responsible and accountable for coordinating all lane closures and for any traffic control issues.
	The TISC shall coordinate with the SRTA TOC for all traffic control activities prior to any lane or shoulder closure.
	The TISC shall coordinate with SRTA, GDOT, GDOT's contractors, other local government agencies, and other entities for traffic control as necessary at SRTA's request.
	The TISC shall participate in traffic control meetings at SRTA's request.
	The TISC shall submit a Traffic Interruption Report (TIR) to the TMC as required by GDOT for all traffic control activities prior to any lane closure.
	Approval of a submitted TIR shall be required before any lanes can be closed by the TISC.

#### 4.5.3 Information Technology Security

SRTA utilizes best practices and adheres to Information technology security policies and standards required by SRTA's Security Policies and Georgia Technology Authority (GTA) as identified based on current NIST 800-53 Standards.

SRTA utilizes RAPID7's "InsightIDR" product for Security Information and Event Management (SIEM). The TISC will provide an equivalent SIEM system as part of its ETCS.

SRTA information systems including the ETCS are subject to both SRTA and GTA policies and standards for information security. The ETCS is rated in the "Moderate" category for data and asset security.

The requirements for Information Technology Security for the Contract are as follows:

No.	Requirement
	The TISC shall provide to SRTA a SOC 1 type 2 audit report annually.

No.	Requirement
	The TISC shall adopt, create, and adhere to appropriate controls for Information Security Plans, Policies, and Procedures based on current NIST 800-53 baseline Moderate Security and Privacy Controls.
	The TISC shall review Information Security Policies and Procedures annually and update, at a minimum, every (3) years or as required by significant changes made to the system or environment.
	The TISC shall provide to SRTA appropriate transparency and read access to the SIEM.
	The TISC shall perform vulnerability scans and resolve identified vulnerabilities as part of the first Revenue Ready Test, each FSIT thereafter, and each SCT.
	After the initial vulnerability scans, the TISC shall perform monthly vulnerability scans to evaluate the security risk to the toll system and identify and resolve potential vulnerabilities.
	The TISC shall perform vulnerability scans each time a new software release is deployed to evaluate the security risk to the toll system and identify and resolve potential vulnerabilities.
	The TISC shall perform vulnerability scans each time new network equipment is added or replaced to evaluate the security risk to the toll system and identify and resolve potential vulnerabilities.
	The TISC shall provide the results of vulnerability scans to SRTA for review, comment, and approval within 3 business days of the test being conducted.
	Vulnerabilities identified during scanning shall be corrected in coordination with SRTA IT staff as necessary. A MOMS work order with an appropriate priority level shall be created for each vulnerability detected.
	SRTA IT conducts an annual risk assessment of SRTA systems and networks. TISC shall participate in this risk assessment and make necessary staff available for interviews and policy/procedure reviews as needed.
	SRTA IT conducts, through a third party, penetration testing to the SRTA network on a scheduled basis. The TISC shall coordinate with SRTA IT and the SRTA authorized third party to conduct of penetration testing to the ETCS.
	TISC shall provide an Incident Response Plan based on the NIST Cloud Incident Response Framework related to the cloud-based services. This plan shall be consistent with SRTA IT's Incident Response Plan. The Incident Response plan shall be a separate deliverable from TISC's Disaster Recovery and Business Continuity plans.
	If the TISC is implementing "on-demand self-service provisioning" for its Cloud infrastructure, the TISC shall conduct a weekly audit of its Cloud services to ensure no unauthorized usage of services has occurred.
	The TISC shall conduct a security risk assessment prior to the TFH Revenue Ready Test for the first toll facility pair.
	The TISC shall ensure that all security risks are mitigated to a level that is required by SRTA and meets all State of Georgia guidelines before TFH goes live for any of the Facility Pairs.
	The TISC shall protect all network interfaces open to internet-capable circuits with firewalls, access control lists and intrusion detection/ prevention systems.

No.	Requirement
	The TISC shall provide a monthly security status report for SRTA review and comment that details on-going work as well as security-related actions identified and completed.

The TISC shall further create the following and test each annually:

1. Information Technology System Security Plan (SSP).
2. Continuity of Operations (COOP) Plan.
3. Cyber Incident Response Plan (IRP).
4. Disaster Recovery Plan (DRP).
5. Information System Contingency Plan (ISCP).

#### 4.5.3.1 Information Technology System Security Plan (SSP)

The TISC shall develop and maintain an Information Technology System Security Plan (SSP) during the Term of the Contract.

Following are the requirements for the SSP:

No.	Requirement
	The TISC shall provide an IT Security Plan that shall be adhered to for the Term of the Contract.
	TISC shall submit the SSP to SRTA for review, comment, and approval within 60 days of NTP.
	The TISC IT Security Plan shall comply with all policies and guidelines of SRTA and Georgia Technology Authority (GTA) as identified and be based on current NIST 800-53 Standards.
	<p>The TISC SSP shall describe personnel, facilities, data, and communications security provisions that shall be utilized for the Project, to include:</p> <ol style="list-style-type: none"> <li>1. Toll equipment cabinet, communication network hub, facility, and housing access.</li> <li>2. ETCS software control including access and user authentication.</li> <li>3. Data privacy and encryption.</li> <li>4. Data communications security.</li> <li>5. SOC compliance for user access including quarterly reviews.</li> <li>6. Compliance with SRTA's Security Policies.</li> <li>7. Specific details related to implementation of cyber-security, protections and post recovery from malware, ransomware, phishing, and other cyber threats.</li> </ol>
	The TISC shall provide an updated SSP no less than annually.
	The SSP shall address TISC cooperation and responsiveness to security audit requests from SRTA and/ or SRTA Designee and other security audit requests in cases of a security incident and/ or breach.
	The TISC shall address security issues related to the Cloud-based services in the IT System Security Plan as appropriate for SRTA to review and approve.

#### 4.5.3.2 Continuity of Operations Plan (COOP)

The TISC shall conduct a Continuity of Operations Plan. The requirements for the COOP are as follows:

No.	Requirement
	The TISC shall provide a Continuity of Operations Plan (VOOP) for SRTA review, comment, and approval 90 days prior to the RRT for the first facility pair.
	The TISC shall develop policies and procedures which shall allow the TISC and SRTA to continue to operate the ETCS in case of system or services failures.
	The TISC shall include in the COOP the approach to business continuity in the event that cloud-based services with the established Cloud Hosting Provider must be discontinued.

#### 4.5.3.3 Disaster Recovery Plan (DRP)

The TISC is to demonstrate their DRP by conducting a full test during testing of the ETCS toll facilities and annually during the maintenance period of each ETCS facility. The requirements for the DRP are as follows:

No.	Requirement
	The TISC shall provide a Disaster Recovery Plan (DRP) for SRTA review, comment, and approval 90 days prior to the RRT for the first facility pair.
	The TISC shall develop policies and procedures which detail and document back-up, storage and restoration of operationally critical hardware, software, and data that meet the requirements in SRTA's Backup Policy.
	The TISC shall develop a Disaster Recovery Plan which meets the requirements in SRTA's business continuity and disaster recovery policy.
	<p>The DRP shall include at least the following:</p> <ol style="list-style-type: none"><li>1. List of Disaster Recovery Team personnel and contact information.</li><li>2. List of critical systems, including Cloud-based services, as determined by TISC and in collaboration with SRTA.</li><li>3. Definition of what incidents/issues can lead to execution of the remediation/recovery processes as defined in the DR Plan.</li><li>4. Communication Plan for declaring a disaster and initiating and managing the applicable disaster recovery processes.</li><li>5. All resources required to implement Disaster Recovery procedures.</li><li>6. Description of data and system backups and locations of backups.</li><li>7. Details of Recovery Time, Recovery Point, and Point in Time objectives.</li><li>8. Identification of procedures for testing recovery plans for each identified disaster or risk.</li><li>9. Initial subsystems damage assessment procedure and checklist.</li><li>10. Architecture and description of redundant subsystems and failover processes.</li><li>11. Details of the procedures/processes to recover from identified disaster scenarios.</li></ol>
	The TISC shall conduct a full test of the DRP as part of the RRT for the first facility pair.



#### 4.5.4 FCC Licenses

The requirements for FCC Licensing are as follows:

No.	Requirement
	The TISC shall complete and compile all Federal Communication Commission (FCC) licensing materials for all broadcast stations installed and operated in the Project.
	The TISC shall provide AVI location and support structure information in compliance with FCC standards.
	The TISC shall provide the completed FCC form(s) to SRTA for submission to the FCC.
	The TISC shall be responsible for providing FCC required information to SRTA as requested for the duration of the contract.

### 4.6 System Design and Software Development

#### 4.6.1 System Design and Software Development Process

This section describes the requirements pertaining to the design and development of the ETCS including all hardware and software, TFH, and roadside components. This includes the process to conclude the final functionality to be provided for the TFH, the creation of the Contract Requirements Conformance Matrix (CRCM), its evolution into a Requirements Traceability Matrix (RTM), the Preliminary and Detailed System and Software Design, the Software Development phase of the Project and extends to any aspect of system design performed for the term of the Project.

The flow of the required System Design and Software Development process is depicted in the diagram below.

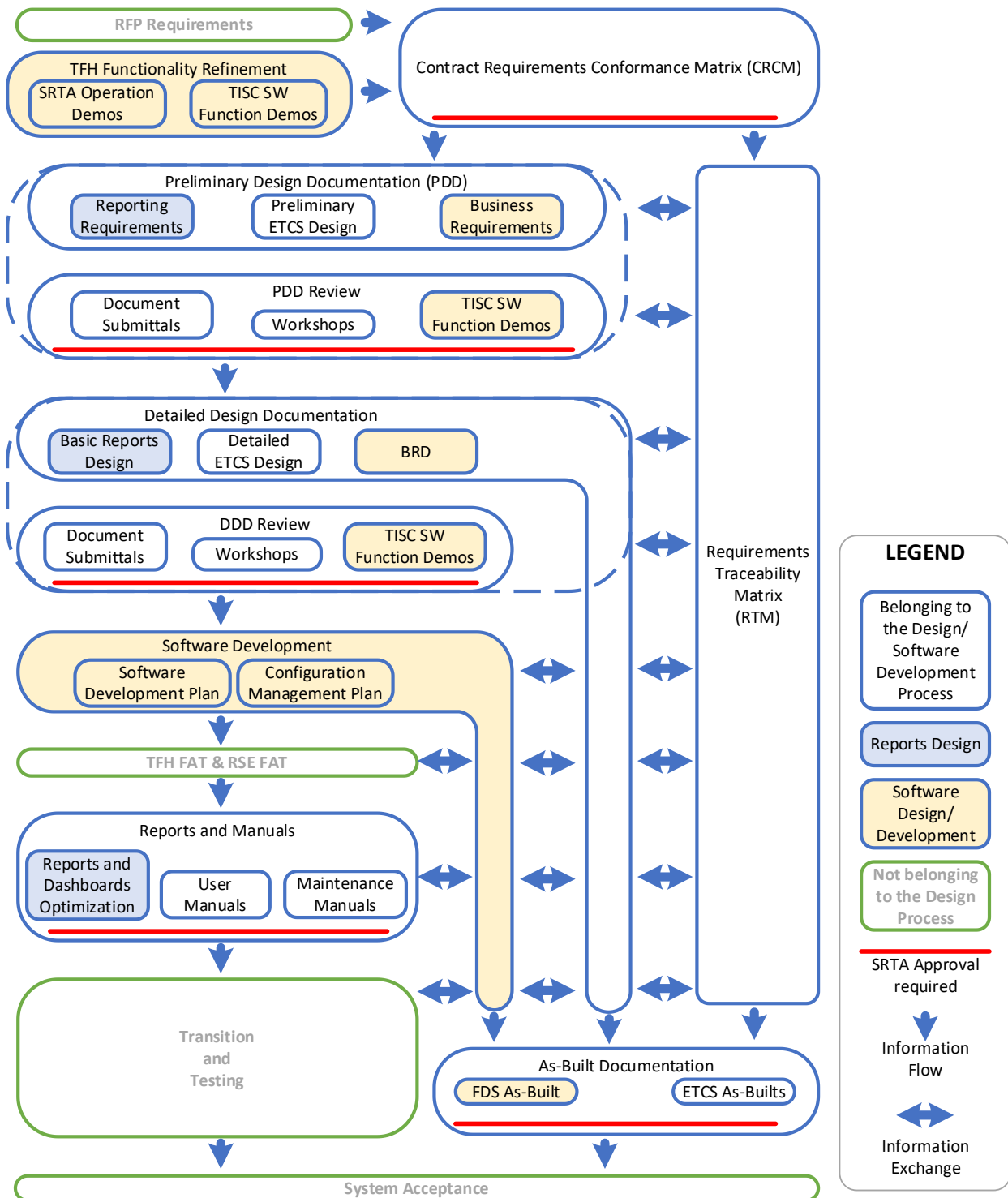


Figure 14: High Level Design and Software Development Process

SRTA will be hands-on during this process requiring weekly Design and Development Progress Meetings until the Detailed Design Documentation is submitted, and bi-weekly (i.e., every other week) Design and Development Progress Meetings thereafter for the TISC to report on all progress. These meetings are to include open discussion for clarification and mock-ups as system design progresses.

Design and development activities, such as workshops and demonstrations, may be observed by SRTA on-site at the TISC's development location, may be conducted by way of web-based demonstrations and conference calls, or may be carried out at SRTA's offices in Atlanta.

Following are the general requirements for design and software development:

No.	Requirement
	With a SRTA-approved CRCM and until SRTA-approval of the Detail Design Documentation (DDD), the TISC shall schedule, coordinate, and conduct weekly Design and Development Progress Meetings.
	For the regular weekly Design and Software Development Progress Meetings, the TISC shall provide the proposed agenda to include all discussion topics and demonstrations at least two working days prior to the scheduled meeting. The TISC shall also provide a look ahead schedule for all design and development activities for the upcoming two-week period.
	The TISC shall identify the SRTA SMEs required to participate in all design and development activities and notify SRTA at least two (2) weeks prior to the SME being required.
	The TISC shall provide low-fidelity mockups throughout the design and development phase for all SRTA-approved new or modified user interfaces.
	The Design and Development Progress Meeting minutes shall include, at a minimum: <ol style="list-style-type: none"> <li>1. Meeting agenda.</li> <li>2. Two-week Look Ahead Schedule.</li> <li>3. Running Action List.</li> <li>4. Running Summary of Clarification Discussions.</li> <li>5. Design Mockups (if any).</li> </ol>
	The TISC shall collaborate with SRTA to determine the exact location of each development review and demonstration no less than three (3) weeks prior to each review and demonstration.
	One (1) week prior to all other design and development activities involving SRTA staff, the TISC shall provide SRTA with an agenda describing the activities to be performed along with all related requirements from the SRTA-approved final RTM.
	The TISC shall conduct additional demonstrations or produce additional design and development artifacts in a timely manner as requested by SRTA.
	The TISC shall schedule a Preliminary Design Review (PDR) when the design phase is near completion to allow the preliminary ETCS design to be interactively reviewed by SRTA.
	The TISC shall provide demonstrations of anticipated system functionality during the PDR.
	The TISC shall be solely responsible for all its own labor and applicable travel costs to attend reviews and/or demonstrations.
	The TISC shall prepare detailed roadside system design plans, shop drawings, and as-builts in accordance with the requirements of this RFP.
	All engineering civil, structural, mechanical, and architectural design work shall be performed under the direct supervision of an engineer of the appropriate discipline licensed in the State of Georgia.

No.	Requirement
	For any submittals required to deliver the scope of work contained in this RFP that require engineering approval (Georgia PE), the TISC shall be responsible for obtaining engineering approval.
	For all submittals requiring engineering approval, the TISC shall submit drafts for SRTA and GDOT review prior to obtaining the Engineer's stamp.
	The TISC shall provide shop drawings and as-built drawings to SRTA and GDOT for approval in support of relocation or expansion of any ETCS infrastructure or equipment.
	The TISC shall propose and receive SRTA and GDOT (if applicable) approval for any new support structures.
	Hardware designs shall describe all hardware specifications including appropriate diagrams and facility layouts.
	Software designs shall describe the module and/or process level.
	Equipment designs shall include any supporting infrastructure the individual equipment items are dependent on.
	The TISC shall use ISO/IEC Standard 12207 for their software and interface design.

#### 4.6.1.1 TFH Functionality Refinement

The intent of this first step of the design process is to undergo a value engineering procedure to tailor the TFH requirements to meet SRTA's underlying needs while making more efficient use of the TISC TFH architecture and existing software platform and minimize software development and associated risk for the TISC. Activity shall comprise mainly of meetings and workshops with TISC and SRTA participation and shall culminate in either a modification of the TFH scope, schedule and budget or a decision by SRTA to continue with the initially contracted TFH scope, schedule and budget without modification.

As the first step in the system design process, SRTA, SRTA's designees and the TISC shall hold a series of workshops to discuss which elements of TFH Functionality that needs software development effort by the TISC shall be included in the scope of work and delivered with the Project.

During the TFH Functionality workshops, the TISC will provide a detailed demonstration of existing TFH functionality using a suitable demonstration arrangement. SRTA will provide a demonstration of how their current systems accomplish the same and any additional functionality which needs to be provided by the TFH. Further, SRTA shall explain in detail, functionality that is required by the TFH and is not available by the current systems. The differences between the TISC-demonstrated capabilities and SRTA's operational needs will be discussed in detail and reviewed to determine if and how they may affect SRTA operations. The TISC will also be required to describe, at least at a high level, the plans for adding, updating or modifying the missing or insufficient functional capability in the proposed ETCS. The end-result of this process shall be recorded and in the CRCM that shall define the requirements baseline to be used in rest of the design and project development phase.

Taking this step early in the Project provides an opportunity for SRTA and the TISC to partner and define the tolling solution that meets SRTA's requirements, that is operationally and financially efficient, and that leverages the value-add of the TISC tolling solution.

Following are the requirements for the TFH Functional Discussion Project:

No.	Requirement
	The TISC shall commit senior technical and management staff to spend a minimum of two weeks on-site shadowing SRTA operations to gather, observe, explore and document all functionality, current issues, and desired improvements.
	Each day, the TISC shall provide comprehensive notes on the operational processes observed to ensure a common understanding of the underlying needs.
	The TISC shall commit at least the following staff to this on-site process: <ol style="list-style-type: none"> <li>1. Project Manager.</li> <li>2. Technical Director.</li> <li>3. Software Architect.</li> <li>4. Business Analyst.</li> </ol>
	The TISC shall then review the contracted TFH requirements, the information gathered during the on-site sessions, and the TISC's existing software architecture to identify where requirements can be modified to leverage the TISC's existing platform to provide SRTA with a platform that meets their underlying needs but also provides: <ol style="list-style-type: none"> <li>1. Enhanced functionality.</li> <li>2. More efficient delivery to SRTA both in terms of cost and schedule.</li> </ol>
	Through a series of comprehensive workshops and software demonstrations, the TISC shall present to SRTA for consideration and review opportunities for alternate approaches, enhancement or efficiency.
	At any point during this Phase, SRTA can elect to terminate the discussions and proceed with delivery of the TFH according to the contracted requirements, schedule and cost.
	Based on the workshops and discussions, the TISC shall develop modified requirements and proposed contract modification(s) through an iterative process with SRTA.
	The TISC shall prepare meeting minutes, action item logs and complete comment disposition matrices for written comments and questions submitted by SRTA throughout this phase.
	This phase shall be considered complete once SRTA has approved the contract modifications or provided written direction to proceed with the unmodified requirements.
	The TISC shall provide the resources necessary to work closely with SRTA to complete this Phase within 3 months of Project Kick-off meeting.

#### 4.6.1.2 Contract Requirements Conformance Matrix

The System Design Process can start right after the Project Kick-off meeting. As the first step in the system design process, the TISC is to build a Contract Requirements Conformance Matrix (CRCM) considering all RFP/ Contract requirements. The CRCM will be completed with the outcome of the TFH Functionality Discussion as soon as agreement is reached between SRTA and TISC on the exact functionality to be provided by the TFH.

Following are the requirements for the CRCM:

No.	Requirement
	The TISC shall submit a CRCM to SRTA for review, comment, and approval no more than ten (10) business days after NTP.
	The TISC shall format the CRCM using as a template Appendix J: TFH Functional Requirements Conformance Matrix.
	The CRCM shall include all requirements contained in the RFP, Business Rules, or via discovery and trace them forward to their eventual design element and eventual test cases. The CRCM may include additional tracing elements to assure all requirements are accounted for during the design and development phase prior to commencing system testing.
	<p>The CRCM format shall include the provision for the following information for all requirements as it becomes available:</p> <ol style="list-style-type: none"> <li>1. Unique and unchanging ID.</li> <li>2. The intended primary and secondary (if any) methods used to verify the requirement (i.e., inspection (I), analysis (A), demonstration (D) or test (T)).</li> <li>3. The uniquely identified test procedure or script number used to verify the requirement.</li> <li>4. The date the requirement was verified (to be used during testing and verification).</li> </ol>
	<p>The completed CRCM shall include the following elements:</p> <ol style="list-style-type: none"> <li>1. Requirements from the contract TFH RCM included in Appendix J: TFH Functional Requirements Conformance Matrix.</li> <li>2. Engineering requirements derived from RCM and RFP requirements and the gap analysis that result in a testable set of requirements.</li> <li>3. RFP section numbers for each requirement (to lowest level section).</li> <li>4. Derived requirements from SRTA's Business rules that cannot be linked to RFP System requirement.</li> <li>5. Verification method for each requirement.</li> <li>6. Test cases as applicable per verification method.</li> <li>7. Training modules as applicable.</li> <li>8. A change log that captures any modification to a document including who made the modification, when, and why it was modified.</li> </ol>

#### 4.6.1.3 Requirements Traceability Matrix

With the start of workshops, demos and Preliminary Design Documentation (PDD) review sessions with SRTA and SRTA's designees, the initial CRCM shall evolve into a Requirements Traceability Matrix (RTM).

The RTM shall be regularly updated during the entire duration of the System Design and Software Development Phase. RTM Review Meetings shall be scheduled, managed and facilitated by the TISC to facilitate RTM updates.

The TISC RTM Review meetings are to be organized based on high-level functionality of the ETCS (e.g., Congestion Pricing, Image Audit, Alerts, Trip Building, Roadside/ITS, etc.).

Following are the requirements for the TISC RTM and the TISC RTM Review Meetings and workshops:

No.	Requirement
	The RTM shall be developed based on the Contract Requirements Conformance Matrix (CRCM).
	The RTM format shall follow the format of the CRCM.
	The RTM shall include and carry forward the same elements of the CRCM.
	<p>The functional topics to be covered at the TISC RTM Review Meetings and workshops shall include:</p> <ol style="list-style-type: none"> <li>1. Congestion Pricing System.</li> <li>2. Image Audit.</li> <li>3. Alerts.</li> <li>4. TOCS.</li> <li>5. Auditing.</li> <li>6. Trip.</li> <li>7. Roadway and System Configuration.</li> <li>8. MOMS.</li> <li>9. Roadside/ITS.</li> <li>10. Network Design.</li> <li>11. Security.</li> <li>12. Cybersecurity.</li> <li>13. Other workshops identified during training.</li> <li>14. Reports and Dashboards (covered in additional review meetings and workshops to be conducted after TFH FAT (see Section 4.6.2.3)).</li> </ol>
	<p>Each RTM Review Meeting or workshop shall include:</p> <ol style="list-style-type: none"> <li>1. A detailed review of each associated requirement in the TISC RTM for the functional topic covered.</li> <li>2. Identification of any requirements for the functional topic in the RTM requiring implementation or modification of the TISC software for compliance.</li> <li>3. A detailed demonstration by the TISC of the existing functionality for the functional topic using the training environment.</li> <li>4. A demonstration by SRTA showing how the current ETCS accomplish the same functionality, where applicable.</li> <li>5. A gap analysis identifying the differences between the TISC system implementation of the capability and SRTA's operational expectations, if any.</li> <li>6. For any requirements gaps or missing requirements, a discussion of how the TISC intends to modify the proposed system to incorporate those capabilities.</li> <li>7. Documentation of the results of the requirements analysis for each functional topic identifying a status for each requirement as: agreed upon between the TISC and SRTA as sufficient to meet SRTA's operational needs; or missing, incomplete or insufficient in the proposed ETCS and the TISC's planned approach for addressing that gap.</li> </ol>
	The TISC team members required to participate in on-site for all TISC RTM Review meetings shall include, at a minimum, the Project Manager, Deputy Project Manager, Technical Delivery Manager, the Software Architect, the Roadside Architect, and Test Director.

No.	Requirement
	The TISC shall use the RTM to validate each Requirement against design item(s), design documentation, and testing procedure(s).
	The RTM shall be maintained as part of change control until Final System Acceptance.
	After system acceptance of a toll facility pair, any changes to the RTM shall be provided to SRTA for approval and as part of the Change Management Plan.

#### 4.6.1.4 Preliminary Design Documentation and Review Process

The Preliminary Design Documentation (PDD) shall be an extension of the Proposal to this RFP and include detailed information on technical approach, methodology, technical risk mitigation, and other issues related to the complete design for the ETCS development. The TISC shall further conduct a thorough inspection of all SRTA/ GDOT provided and maintained infrastructure elements (gantries, structures, conduit, manholes etc.) necessary to install and operate the ETCS and prepare and submit to SRTA an Infrastructure Deficiency Report (IDR) as part of the PDD. The report shall list all elements that need to be modified, replaced, or upgraded with the relevant substantiation.

The requirements to be addressed in the PDD shall include the following:

No.	Requirement
	<p>The TISC shall provide the following in the PDD:</p> <ol style="list-style-type: none"> <li>1. Functional narrative text.</li> <li>2. System and Subsystem block diagrams, data flow diagrams, data structure diagrams, schematics, and any other graphic illustrations to demonstrate the technical adequacy of the ETCS design approach and compliance for System Requirements.</li> <li>3. Screen layouts.</li> <li>4. Report formats.</li> <li>5. Software/database design.</li> <li>6. Configuration parameters.</li> <li>7. Communications design.</li> <li>8. System capacity and performance calculations.</li> <li>9. Interfaces.</li> <li>10. A list of equipment for each function along with a description of its role.</li> <li>11. An Infrastructure Deficiency Report.</li> </ol>
	<p>In addition, topics to be discussed in the PDD shall include at least the following:</p> <ol style="list-style-type: none"> <li>1. Toll Facility Host design: <ol style="list-style-type: none"> <li>a. Functionality.</li> <li>b. System function flow chart for each facility.</li> <li>c. Cloud hosting.</li> <li>d. Hardware, specifications and integration.</li> </ol> </li> <li>2. RSE facility design: <ol style="list-style-type: none"> <li>a. System function flow chart.</li> <li>b. Hardware, specifications and integration.</li> </ol> </li> </ol>



No.	Requirement
	<ul style="list-style-type: none"> <li>c. User functionality.</li> <li>3. Communications.</li> <li>4. Suitability, adequacy of civil and structural infrastructure.</li> <li>5. Capacity of existing Generators.</li> <li>6. Capacity of existing HVAC installations.</li> <li>7. Maintenance functionality.</li> </ul>
	In addition, the TISC shall address and show compliance with QA, reliability, maintainability, software development, and other System requirements. Hardware concept drawings and preliminary level engineering specifications shall be submitted during the PDD phase.
	The TISC team members to participate on-site for all TISC PDD Review meetings shall include, at a minimum, the Project Manager, Deputy Project Manager, Technical Director, Roadside Architect, and Test Director and key developers.
	The PDD Review will begin with a one- to two-day design executive overview presentation that will be attended by SRTA's Project Management and Project team. The detailed review will continue thereafter.
	Each of the PDD reviews may be broken into multiple sessions and may be followed up by subsequent additional sessions in the event material could not be covered or issues could not be settled in the allotted time.
	The agenda for the review and the PDD documents that are scheduled for examination at the reviews shall be delivered to SRTA at least 10 Business Days prior to the beginning of the first session of the review.
	Additional design review meetings may be held during the development process, as SRTA and the TISC deem necessary.

#### 4.6.1.5 Detailed Design Documentation and Review Process

The Final Detailed Design Documentation (DDD) shall be an extension of the approved PDD. The topics discussed and information presented in the DDD shall include an update of all information presented and accepted in the PDD.

No.	Requirement
	The DDD shall be an expansion of the approved PDD documents.
	The DDD shall describe the design specifications of all hardware, software, and network communications to be provided by the TISC to meet the requirements of this RFP.
	The DDD shall describe specific unique designs for each toll facility, as applicable.
	<p>The DDD shall include the following, at a minimum:</p> <ul style="list-style-type: none"> <li>1. System, subsystem, and module level descriptions and interaction between modules.</li> <li>2. Logical design including data flow diagrams depicting various processing queues and entity relationship diagrams.</li> <li>3. Database design including data dictionary.</li> <li>4. Hardware designs.</li> </ul>

No.	Requirement
	<ul style="list-style-type: none"> <li>5. Software designs.</li> <li>6. Equipment designs.</li> <li>7. User interface design including menus and screens.</li> <li>8. Reports and Dashboards designs and formats (To be provided after TFH FAT. See Section 4.6.2.3).</li> <li>9. Operational procedures.</li> <li>10. Full description for all COTS software including software manuals.</li> <li>11. List of equipment for each subsystem along with a description of the role of the subsystem or equipment.</li> <li>12. Specification sheets for all equipment including full hardware manuals for all COTS hardware and compliance matrix relative to requirements.</li> <li>13. Computer/ server sizing and design details.</li> <li>14. Requirements for all peripheral device interfaces.</li> <li>15. Description of system diagnostics, status monitoring, and error handling.</li> <li>16. Description of redundancy and failover processes.</li> <li>17. Data integrity assurance plan.</li> <li>18. File and transaction and maintenance message formats.</li> <li>19. System and physical security design description and layout.</li> <li>20. Data communications/network diagram.</li> <li>21. Estimated data communication load and existing bandwidth capacity.</li> <li>22. Estimated electrical loads and cooling requirements for the existing generators and HVAC equipment.</li> <li>23. Any other pertinent design documentation necessary to communicate the detailed design of the ETCS.</li> </ul>
	The TISC shall submit the DDD for SRTA review, comment, and approval per the schedule in Appendix H: Deliverables Schedule.
	The DDD submittal shall be updated and fully approved by SRTA prior to SRTA approval to proceed with transition activities.
	The TISC shall conduct comment review and resolution meetings with SRTA and SRTA's designees to review and resolve all comments on the DDD.
	The TISC shall respond to all comments in the draft DDD prior to scheduling the Detail Design Review (DDR). Where possible, the TISC shall resolve all comments to the DDD prior to the DDR unless otherwise agreed to by SRTA.
	The TISC shall conduct a Detail Design Review to review the DDD with SRTA and SRTA's designees for each toll facility.
	Upon completion of the DDR meetings, the TISC shall revise and re-submit the DDD to SRTA for final review and approval.
	Upon SRTA's approval of the DDD, the TISC shall commence development and implementation of the ETCS.
	The TISC shall update the DDD for SRTA review and approval for each toll facility within two (2) months of System Acceptance of a toll facility pair.

No.	Requirement
	The TISC shall incorporate and re-submit the DDD for SRTA review and approval for any design modifications, change orders and field installation changes that occur during the Project within two (2) months of completion of any ETCS modification.
	The TISC shall submit an updated DDD as modifications are made and SRTA shall approve RTM changes for any linked documents.
	The TISC shall submit an updated DDD annually.
	The DDD Review will begin with a one- to two-day design executive overview presentation that will be attended by SRTA's Project Management and Project team. The detailed review will continue thereafter.
	Each of the DDD reviews may be broken into multiple sessions and may be followed up by subsequent additional sessions in the event material could not be covered or issues could not be settled in the allotted time.
	The agenda for the review and the DDD documents that are scheduled for examination at the reviews shall be delivered to SRTA at least 10 Business Days prior to the beginning of the first session of the review.
	Additional design review meetings may be held during the development process, as SRTA and the TISC deem necessary.

#### 4.6.2 Software Development

The Software Design and Development Process shall follow ISO 12207 standard guidelines. The TISC shall create a Software Development Plan and a Configuration Management Plan for the development and maintenance of the TFH and RSE software for this project.

##### 4.6.2.1 Software Development Plan

A detailed Software Development Plan shall be prepared and submitted to SRTA for approval.

Below are the requirements for the Software Development Plan:

No.	Requirement
	<p>This plan shall indicate all elements of the software development process and shall include the following:</p> <ol style="list-style-type: none"> <li>1. Software Development Schedules.</li> <li>2. Software Development standards.</li> <li>3. Assignments to Sub-contractors.</li> <li>4. Programming Languages.</li> <li>5. Software Development environments utilized.</li> <li>6. Software Testing Plan.</li> <li>7. Software Documentation Plan.</li> <li>8. Software Management Plan.</li> </ol>
	A complete program of software testing with references to the Master Test Plan and related software test procedures shall be defined as part of the Software Development Plan.

No.	Requirement
	The Software Development Plan shall include a description of documentation to be provided for application programs, as well as incorporating all standards to be followed and sample documentation, where available.

#### 4.6.2.2 Configuration Management Plan

The TISC is required to closely follow a configuration management process for the term of the Contract. For this purpose, the TISC shall develop a Configuration Management Plan.

The requirements for Configuration Management Plan are as follows:

No.	Requirement
	The TISC shall develop a Configuration Management (CM) Plan for the Project that describes the processes and procedures that will be implemented to track and manage COTS and custom application software, hardware, and configuration files.
	The TISC shall submit the CM Plan to SRTA for review and approval.
	The CM Plan shall be in accordance with SAE ANSI/EIA-649C "Configuration Management Standard" and 828-2012 IEEE Standard for Configuration Management in Systems and Software Engineering.
	The CM Plan shall describe the processes for: <ol style="list-style-type: none"> <li>1. Release Management.</li> <li>2. Versioning and maintaining all custom and COTS products.</li> <li>3. Keeping all products current.</li> <li>4. Assuring uniformity of installed software versions and releases.</li> <li>5. Testing all required upgrades.</li> <li>6. Addressing implications and reconciliation of vendor support termination.</li> </ol>
	The CM Plan shall include the description of all COTS software by manufacturer, vendor contact information, model or part number, serial number, feature set, and serviceable expiration.
	In the CM Plan, all COTS software descriptions shall include whether it is a cloud subscription (a service in the cloud or Software As A Service (SAAS)), manufacturer, version number, lifecycle, feature set, and number of user licenses provided.
	The CM Plan shall include the description of all COTS hardware by manufacturer, vendor contact information, model or part number, serial number, and feature set.
	The TISC shall use proven configuration management tools and techniques throughout the Project as documented and approved by SRTA in the CM Plan to track and control versions of hardware, COTS software products, and customized software.
	The CM Plan shall describe all configuration management tools utilized by the TISC.
	Once any component of the proposed ETCS is placed into revenue production, the TISC shall adhere to the Change Management Plan for any modification or replacement.
	The TISC shall document all approved production hardware or software changes as part of the configuration management process as defined in the CM Plan.

No.	Requirement
	The TISC shall provide and maintain specific change and release management plans in the CM Plan that reflects the methodologies for the approval and release of any subsystem changes including simple configuration changes or hard code changes.

#### 4.6.2.3 Reports and Dashboards Design and Development Process

SRTA will utilize baseline reports provided by the TISC during the TFH FAT to verify the system data. SRTA will review the TISC RTM in detail with the TISC for all reports and dashboards requirements after the TFH FAT. Reports and dashboards are to be implemented after the TISC RTM detail review of reports and dashboards and after SRTA has approved an updated DDD that includes all designs for reports and dashboards. New and/or updated reports and dashboards are verified to meet the requirements of this RFP during several of the required test phases as defined in Section 4.8: Testing and Related Documentation.

SRTA reviews and approves reports in the following stages:

1. Initial draft for a general overview.
2. Initial draft 2 with data dictionary (all fields and filters defined).
3. System generated with data populated. Review/comments.
4. Final Approval.

The requirements for the design and development process for reports and dashboards are as follows:

No.	Requirement
	<p>The TISC shall submit Preliminary Reports Design Documentation (PRDD) for SRTA review and approval with the submission of PDD. The PRDD shall contain the following types of information:</p> <ol style="list-style-type: none"> <li>1. Introduction and audience.</li> <li>2. General reporting procedures: <ol style="list-style-type: none"> <li>a. Content selection.</li> <li>b. Access control.</li> <li>c. Printing, saving and exporting.</li> </ol> </li> <li>3. Categorized report sections containing the following for each report: <ol style="list-style-type: none"> <li>a. Report name, description and frequency.</li> <li>b. Inputs.</li> <li>c. Outputs.</li> <li>d. Sample report.</li> <li>e. Related reports and processes.</li> </ol> </li> <li>4. Ad-hoc reporting procedures.</li> </ol>
	The TISC shall provide baseline reports necessary for SRTA to verify all system data during TFH FAT.

No.	Requirement
	After the TFH FAT, the TISC shall schedule, manage, facilitate, conduct, and document a TISC RTM Review meeting for reports and dashboards.
	After the TISC RTM Review meeting for reports and dashboards, the TISC shall submit an updated FRDD for SRTA review and approval that includes all designs for all reports and dashboards per the requirements of this RFP. This document shall be an extension of the accepted PRDD. The topics discussed and information presented in the PRDD shall include an update of all information presented in the PRDD.
	The TISC shall provide all reports and dashboards as documented in the SRTA approved FRDD prior to the TFH Revenue Ready Test for verification during the TFH Revenue Ready Test.
	No later than six (6) months after the TFH Revenue Ready Test, the TISC shall schedule, facilitate, conduct, and document a Reports and Dashboards Workshop for SRTA and the TISC to agree upon modifications to the reports and dashboards.
	The TISC shall submit the updated DDD to SRTA for review and approval no more than one (1) month after the Reports and Dashboards Workshop.
	The TISC shall implement reports and dashboards as defined in the SRTA approved DDD after the RTM Review meeting for reports and dashboards and after the Reports and Dashboard Workshop.

#### 4.6.2.4 Source Code Deposit to Escrow Agent

After the successful completion of the second Facility Pair OAT and before award of the Final System Acceptance, the TISC shall deposit their own source code and all related software documentation used in this Project to an Escrow Agent.

The following requirements shall apply:

No.	Requirement
	The TISC shall deliver the source code and related software documentation to the Escrow Agent within ten (10) days after successful completion of the TFH and Roadside FAT.
	After initial delivery, the TISC shall maintain the source code and related software documentation with the Escrow Agent through the Term of the Contract.
	The TISC shall be required to enter into an Escrow Agreement with SRTA.
	The TISC shall update the source code and related software documentation deposited to the Escrow Agent at the earliest thirty (30) days, and the latest sixty (60) days, after a new code version is used by the system.
	SRTA shall have rights of access and inspection to the Escrow to be defined in detail in the Escrow Agreement.

### 4.6.3 ETCS Design Documents

#### 4.6.3.1 Design Submittals

The requirements for ETCS design submittals are listed below:

No.	Requirement
	All documentation regarding the installation of Toll infrastructure, equipment, devices, and electronics for every ETCS toll facility shall be authored and maintained by the TISC.
	All drawings and other documentation shall be submitted to SRTA for review and approval.
	The TISC shall prepare technical reports, plans, shop drawings, and as-builts in accordance with the GDOT standards as to design criteria, procedures, and format as contained within the GDOT RFP procurement documents, and within the TISC procurement documents as applicable.
	The TISC shall ensure that the locations, positions, installation, connections, and other elements of the TISC installed Toll equipment and devices identified in the design and installation drawings provided by the TISC are accurate and correct.
	The TISC shall provide detailed manufacturer specification (cut sheet) documents for all Toll devices that are provided for the ETCS design. Where specification detail documents are not available, links to web sites with product details, specifications, and requirement shall be provided to SRTA.
	<p>The TISC shall submit the following design drawings to SRTA for each Toll site in every ETCS toll facility where Toll infrastructure, equipment, devices, electronics, and other ancillary hardware are installed by the TISC:</p> <ol style="list-style-type: none"> <li>1. Detailed installation drawings for each piece of equipment.</li> <li>2. Detailed drawings showing the Toll infrastructure, including Brackets, and details of their installation to the Developer equipment support structures.</li> <li>3. Details related to the range of equipment adjustments.</li> <li>4. Detailed drawings providing the structural load information.</li> <li>5. Lane geometry.</li> <li>6. Detailed electrical schematics for each Toll site.</li> <li>7. Power panel schedules.</li> <li>8. Toll equipment cabinet and network communication hub rack layout and interconnection drawings of the communication wires.</li> <li>9. Detailed communication layout.</li> <li>10. Detailed conduit layout for power and communications.</li> <li>11. Power and communication cabling schedules.</li> <li>12. Detailed component level network drawings showing all WAN, LAN, MAN, and VLAN connections, including connection to the roadside system.</li> </ol>

#### 4.6.3.2 Bill of Materials

The TISC shall include a Bill of Materials (BOM) for each ETCS facility. The requirements for the Bill of Materials are as follows:

No.	Requirement
	The Bill of Materials (BOM) for each ETCS facility shall include all hardware, COTS software and equipment both supplied and reused under this Agreement.
	The TISC shall include their proposed spare inventory in the BOM.

No.	Requirement
	For all COTS components, the BOM shall include manufacturer, vendor contact information, model number and feature set, and description of the component.
	The TISC shall include the BOM in the Detailed Design Documentation (DDD).
	The TISC shall receive SRTA approval of the final BOM and the DDD prior to purchase of any Equipment for an ETCS toll facility, unless otherwise authorized in writing by a SRTA authorized representative.

#### 4.6.4 Software Design Documents

The Software Design documentation to be submitted by TISC and approved by SRTA shall include as a minimum the following documents:

##### 4.6.4.1 Business Requirements Document (BRD)

The TISC shall prepare a Business Requirements Document that shall document a complete inventory of business rules that can be accommodated by the ETCS software functionality.

It shall further indicate how the ETCS will accommodate SRTA's existing business rules, and how the Toll System accommodates potential changes to business rules.

##### 4.6.4.2 User Experience Plan

The TISC shall prepare a User Experience Plan (UXP) to ensure that the ETCS will meet SRTA's requirements for user-friendliness and consistency of ETCS user interfaces.

The requirements for the User Experience (UXP) are as follows:

No.	Requirement
	The TISC shall submit a User Experience Plan (UXP) describing their strategy for developing a system user experience that meets SRTA's requirements for user-friendliness and consistency.
	The TISC UX Lead shall lead the development of the UXP.
	The TISC UX Lead shall collaborate with the TFH Operations Liaison to assist in the development of the UXP.
	The UXP shall describe how the TISC will conduct research to understand requirements, observe users in their environment, and to develop use cases, user flows, and user personas.
	The UXP shall describe how the TISC will provide designs that generate initial mockups through low-fidelity sketches and wireframes and will update designs based on SRTA feedback.
	The UXP shall describe how the TISC will provide designs for final user interface graphics with detailed design specifications including colors, themes, styles, and guidelines.
	The UXP shall describe how the TISC will produce the final user interface and user experience as a fully functional prototype.
	The UXP shall describe how the TISC will conduct user testing on the fully functional prototype.



No.	Requirement
	The UXP shall describe the method of collecting and incorporating feedback from SRTA throughout this process to ensure that the User Experience/User Interfaces (UX/UI) meet SRTA's requirements.
	The TISC shall receive SRTA approval of the UXP before any user interface or user experience designs can commence.
	The UXP shall be used during the design and development phase for all UX/UI designs as well as throughout the term of the Contract.

#### 4.6.4.3 Database Documentation

The TISC shall provide a data dictionary and data schema(s) for the system database, including how it relates to data and reporting functions in the front-end operational GUI.

The requirements for database documentation are the following:

No.	Requirement
	The TISC shall ensure that the database documentation contains sufficient detail by consulting with relevant SRTA staff and shall be refining documentation until accepted by SRTA. This is required during original system acceptance and following every subsequent change to the database structure.
	While designing the database and producing the relevant documentation, the TISC shall consider SRTA's roadside data mart and work together with SRTA throughout design, testing and hyper-care period to address, in detail, data and reporting requirements and ensure effective integration and end-user experience.
	The data dictionary shall be detailed enough to allow SRTA database administrators to access and develop their own audit and general SQL queries.
	<p>The Data Dictionary shall contain:</p> <ol style="list-style-type: none"> <li>1. Data element definitions, including tables, fields, key fields, primary keys, relationships, codes, etc.</li> <li>2. Program elements (stored procedures, scripts, etc.) used by the database to move data about or to manipulate it in some way.</li> <li>3. Numbers of Records.</li> <li>4. System parameters.</li> <li>5. System information.</li> <li>6. Files or other System components.</li> <li>7. User information.</li> <li>8. Entity relationship diagrams.</li> <li>9. Schema.</li> </ol>
	<p>The table definitions define the tables used in the database, including a detailed description of their use, the key fields, the primary key, and a list of the fields. Each table definition shall include:</p> <ol style="list-style-type: none"> <li>1. Table name.</li> </ol>

No.	Requirement
	<ol style="list-style-type: none"> <li>2. Table detailed description.</li> <li>3. Table owner or database name.</li> <li>4. Data element, or column, or field name definitions.</li> <li>5. Key order for all the elements.</li> <li>6. Indexes.</li> <li>7. Table organization.</li> <li>8. Duplicate rows allowed or not allowed.</li> <li>9. Table size.</li> <li>10. Business context of the table.</li> </ol>
	<p>The data elements shall include:</p> <ol style="list-style-type: none"> <li>1. Field names.</li> <li>2. Related elements (i.e., which data elements are related to which other data elements in the database schema and in the front-end operational reporting system and GUI).</li> <li>3. Data type (character, numeric, etc.) and size.</li> <li>4. Detailed elements description (i.e., what data is held in the field).</li> <li>5. Default values, including whether null values are allowed.</li> <li>6. Validation rules, if any, between this element and other elements in the dictionary.</li> <li>7. Database table references (i.e., where the data elements are used and whether each data element is the primary key for a table, or a part of the key).</li> <li>8. Data sources/lineage (i.e., where the data comes from, including rules used in calculation to producing data element values).</li> </ol>
	<p>The program elements shall include:</p> <ol style="list-style-type: none"> <li>1. Stored procedures (e.g., SQL scripts) that are integral to the database.</li> <li>2. External procedures (e.g., Unix scripts).</li> <li>3. The dictionary shall also include descriptions of each process carried out by the database System, including. <ol style="list-style-type: none"> <li>a. Where and how data enters the System, including all sub-system components, and the relationships between sub-systems and the database schemas.</li> <li>b. What is done to the data, at which stage, and why.</li> <li>c. What are the outputs, if any, of the System; and</li> <li>d. The business context of the process.</li> </ol> </li> </ol>
	<p>All definitions shall include the following: a broad description, distinguishing characteristics, and functional qualifiers.</p>
	<p>The data dictionary will be reviewed and finalized during the design phase. Acceptance of the data dictionary will be one of the factors for Factory Acceptance Test (FAT) approval.</p>
	<p>Database documentation shall be stored in SRTA's Document Management platform in an editable format according to SRTA's standards and maintained there, accessible to authorized SRTA personnel.</p>
	<p>Database documentation shall be updated with every change made to the database structure. Such updates shall be considered integral components of the change control process.</p>

#### 4.6.4.4 Interface Control Documents

The TFH will be required to communicate with various components of the ETCS, as well as with third-party entities. The communications between the TFH component systems, the TFH and SRTA, and the TFH and third parties will be described by Interface Control Documents (ICDs).

SRTA shall provide to the TISC the ICDs for the following interfaces (existing ICDs):

1. The GDOT ATMS interface. (Attachment 9: GDOT ATMS ICD).
2. The SRTA Commercial Back Office interface. (Attachment 10: STI ICD for a description of SRTA's CBO interface).
3. The Georgia Tech interface. (Description to be found in Attachment 11: Georgia Tech Interface).
4. The Managed and Tolloed Lane Feed Specification Interface as defined in Section 2.2.5.12.4: Managed and Tolloed Lane Feed Specification Interface.

The ETCS is required to meet the following minimum Interfaces requirements:

No.	Requirement
	Only non-proprietary, industry standard protocols and data structures shall be used to establish the communication interfaces required between all systems, components, peripherals, and subsystems of the ETCS.
	At a minimum, all messages from the Zone Controllers, TRDMSs, Traffic Sensors, CCTV cameras, and Travel Time Site AVI subsystems to the TFH and/or 3rd party applications shall utilize documented, open (available to SRTA) transmission protocols or protocol stacks.
	During the Design Phase, the TISC shall coordinate workshops and reviews with SRTA to identify the required Interfaces, protocols and related requirements based on the TISC's proposed ETCS solution.
	For each identified Interface, the TISC shall design and develop an Interface Control Document (ICD) if one does not exist.
	All ICDs shall include, but not be limited to, the following information: <ol style="list-style-type: none"><li>1. File or Message Formats.</li><li>2. Guaranteed Delivery Structure.</li><li>3. Receipt Acknowledgement.</li><li>4. Error Checking and Handling.</li><li>5. Retransmission Procedures.</li><li>6. Archiving.</li><li>7. Timing.</li><li>8. Data Processing and validation.</li><li>9. Other Related Specifications.</li></ol>
	For any interface that utilizes an existing ICD, the TISC shall use the ICD as is with modifications made only where necessary and as approved by SRTA.

No.	Requirement
	The TISC shall submit all ICDs for SRTA review, comment, and approval during the Design Phase of the Project.
	Each TISC developed ICD shall describe the physical, functional and performance aspects of its documented interfaces.
	All TISC developed ICDs shall contain data flow diagrams to illustrate the flow of data relevant to the interface.
	All Interfaces shall document the methods of protecting and securing the data within the ICD.
	All TISC developed ICDs shall describe all alerts and/or notifications provided by the interface.
	The TISC shall prepare and maintain for the duration of the Contract an Interface Specification Catalog.
	The Interface Specification Catalog shall be subject to SRTA review and approval.
	The Interface Specification Catalog shall include at a minimum: <ol style="list-style-type: none"> <li>1. Interface name.</li> <li>2. Purpose of Interface.</li> <li>3. ICD author.</li> <li>4. Current resource assigned to maintain the Interface.</li> <li>5. Latest ICD/web service definition language (WSDL) name/version and system location.</li> </ol>
	The TISC shall provide annual updates to the Interface Specification Catalog and ICD/web service definition language (WSDL) versions.

#### 4.6.5 As-Built Drawings/Documents

After the completion of OAT of each Facility Pair, and in any case prior to Final System Acceptance, the TISC shall submit the As-Built Documentation to fully document the final Toll Host and In-Lane Toll Systems Design, implementation, and installation. That shall include all software and hardware changes made during the system development and testing phases.

The TISC is required to provide and maintain as-built drawings of all ETCS facilities. SRTA will review and approve the format of the as-built drawings, to ensure they include the required level of detail. SRTA will also review the as-built drawings for content and will accept the drawings only when the TISC has complied with the requirements as set forth in this RFP. Typical drawings generalizing all ETCS locations are not considered as-builts and will not be accepted as as-builts.

No.	Requirement
	The TISC shall provide one (1) complete electronic set of as-built drawings for the ETCS in any "native" file format such as MicroStation, Visio, Excel, Word, etc.
	The TISC shall provide one (1) complete electronic set of as-built drawings in a searchable PDF format on read-only media.
	The as-built drawing sets shall include the ETCS architecture, all schematics, logic diagrams, layouts, wiring diagrams, assembly drawings, parts detail drawings, and installation drawings.

No.	Requirement
	The set of as-built drawings shall consist of a title sheet, an index sheet, and the various as-built drawings.
	The index sheets shall include a listing of all drawings with headings for Drawing Number, Drawing Title, and the type of drawing, such as assembly, schematic, material list, wiring diagram, wire list, or similar categories.
	The TISC shall submit all as-built drawings for SRTA review and approval.
	As-built drawings shall be delivered no later than ninety (90) days after the SRTA-approved OAT for the facility pair.
	If at any time during the operations of the ETCS should physical construction or installation be modified for any reason, the TISC shall submit updated as-built drawings within one (1) month of completion of a modification.
	The TISC shall incorporate and re-submit the as-built drawings for SRTA review and approval for any design modifications, change orders and field installation changes that occur during the project.
	Updated As-builts shall clearly indicate changes compared to previous version.

#### 4.6.6 System User Manuals

The TISC is required to provide a set of easy-to-use User Manuals to enable users to perform their assigned tasks on the ETCS. The User Manuals to be provided include but are not limited to:

1. Roadside System Manual.
2. Congestion Pricing System Manual.
3. Image Processing System Manual.
4. Trip Building System Manual.
5. Audit Manual.
6. Toll Operation Center System (TOCS) User Manual.
7. Reports User Manual.
8. Transactional Reconciliation Manual.
9. Maintenance and Service Manual.
10. MOMS User Manual.

Additional user manuals may be identified during the design process.

The requirements for the System User Manuals are as follows:

No.	Requirement
	The TISC shall provide a set of user manuals designed to provide the intended users with the information necessary to perform their ETCS-related work.

No.	Requirement
	The TISC shall provide clearly written manuals that provide a logical, system-oriented organization and content.
	All TISC-provided manuals shall incorporate a full range of diagrams, illustrations, graphics, screenshots, tables, and instructions required to perform supported ETCS functions.
	The TISC shall provide manuals in both hard copy (20 copies), Microsoft Office application format, and searchable PDF format.
	All TISC-provided manuals shall take the format of a 'How to' guide when outlining the step-by-step process that a user must follow to complete a task.
	All TISC-provided 'How to' guides shall be concise, use verbs to start steps, and incorporate numbered lists, headings, and visuals to present clear instructions to the user.
	The TISC shall develop and submit all manuals for SRTA review, comment, and approval.
	User Manuals shall cover all aspects of each subsystem functionality accessible by a GUI to include, but not limited to: <ol style="list-style-type: none"> <li>1. Authentication.</li> <li>2. Screen navigation.</li> <li>3. Menu items and descriptions.</li> <li>4. Drill down capability and description.</li> <li>5. Graphics capability.</li> <li>6. Report generation.</li> <li>7. User-configurable parameters.</li> </ol>
	User Manuals shall describe how system configuration is performed along with other administrative aspects.
	User Manuals shall include screen representations and explanations of each field, drop down menu choice, link, URL, and navigation buttons.
	The TISC shall make appropriate updates to all manuals within 30 days of OAT approval for each toll facility.

## 4.7 Implementation

### 4.7.1 Transition Plan

The TISC shall prepare and submit to SRTA a Transition Plan.

The Transition Plan shall detail the order by which the existing facilities will be transitioned, the order of transition per toll site type, and the requirements for coordination with the TSI's, SRTA, and GDOT to maintain the parallel operation of the existing toll systems and the ETCS.

The requirements of the Transition Plan include:

No.	Requirement
	After award, the TISC shall update the Draft Transition Plan submitted with the proposal as necessary and receive final SRTA approval prior to any transition activities commencing.

No.	Requirement
	The TISC shall review and collect feedback on the Transition Plan with the existing TSIs providing the production SRTA ETCS toll facilities.
	The Transition Plan shall include the Transition Team Organization Chart, Staffing Plan, and Staff Credentials.
	The Transition Plan shall include all expected SRTA Staff support throughout the transition process in detail, by facility, by task.
	The Transition Plan shall include entry/exit criteria checklists for each proposed phase of the transition process.
	The Transition Plan shall include the level of coordination effort required based upon the work that is required to install, test, and integrate the new roadside tolling system.
	The Transition Plan shall include the detailed plan that ensures minimal degradation in toll system revenue generation during the transition period by meeting or exceeding the "Transition SLAs" as defined in Appendix E: Service Level Agreements (SLAs).
	The Transition Plan shall acknowledge and include the detailed steps for the TISC TFH becoming the revenue system of record for the existing TSI roadside toll system with SRTA-approval of the TFH INT prior to the commencement of the conversion of the existing roadside toll equipment for that facility pair.
	The Transition Plan shall include the TISC as responsible for performance and maintenance of the newly transitioned zones while the legacy vendor continues to maintain all legacy zones until all zones have been transitioned and decommissioned.
	The Transition Plan shall include the complete transition and SRTA-approved OAT of one set of facility pairs (75A&B, 85A&B) at a time.
	The Transition Plan shall detail the approach to the transition of each site in each existing TSI toll facility to include the transition of the equipment on each site as well as the order by which the sites will be transitioned.
	The Transition Plan shall include a detailed removal, installation, and tuning steps for transitioning each Toll Point and ITS site (See Appendix B: Single Line Diagrams).
	The Transition Plan shall include a list of any/all existing ITS and/or legacy tolling equipment the TISC requires access to complete the system testing requirements.
	The Transition Plan shall include the list of required existing ITS and/or legacy tolling equipment by test phase.
	The Transition Plan shall incorporate and include the decommissioning plan for I-85 Toll Points.
	The Transition Plan shall incorporate and include the decommissioning plan for Travel Time Sites.
	The Transition Plan shall include Site Commissioning Testing (SCT) for any/all roadway equipment refresh or reconfiguration prior to being placed back into production with the revenue system of record.
	The Transition Plan shall include specific plans for maintaining network efficacy and stability throughout the transition.

No.	Requirement
	The Transition Plan shall include a detailed description of the roll back processes and procedures to restore the TFH and/or network back to its original state/condition if required.
	The Transition Plan shall refer to the Traffic Control plan for all phases of the proposed transition as required.
	The Transition Plan shall document clear lines of demarcation for maintenance for each subsystem for each facility pair between the existing TSI and the TISC to ensure clarity of which party is responsible for maintenance and response to outages for each facility pair throughout the transition.
	The Transition Plan shall document all anticipated impacts to toll system revenue during transition, to include anticipated durations of Toll Point outages, partial trip build, and/or lane closures.
	The Transition Plan shall document all anticipated impacts to customers to include the anticipated durations of lane closures, rate sign outages, or trip building accuracy.
	The Transition Plan shall document all anticipated impacts on SRTA Operations.
	The Transition Plan shall include the timeline for replacing the TOC workstations in an efficient way so that all roadway systems and equipment, whether already transitioned or not, are able to be fully monitored and operated as normal by SRTA personnel.
	The Transition Plan shall document when roadside equipment will be replaced or reconfigured within the transition.
	The Transition Plan shall include a detailed Transition Schedule for each existing TSI toll facility (75A, 75B, 85A, 85B) with transition dates to the individual site level with major transition milestones to include, at a minimum: Transition Plan Approval, TFH FAT completion, Roadside FAT completion, TFH INT completion, TFH Go Live, Roadside Toll System conversion completion, SIT completion, SAT start, SAT completion.
	The Transition Plan shall include a Transition Schedule that complies with all requirements set forth in this RFP and demonstrates the complete transition of both toll facility pairs (85A/B, 75A/B).
	The Transition Schedule shall include the completion of all tests required as described in Section 4.8.1: ETCS System Testing.
	The Transition Schedule shall include detailed timelines by task for the transition of each toll facility pair showing anticipated work windows and the length of time required to perform the work.
	The Transition Plan will address all coordination required for the entire transition phase of all existing TSI toll facilities.
	The Transition Plan shall include the Network Transition Plan.
	The Network Transition Plan shall include the detail necessary that demonstrates how the network will be transitioned from the current configuration for the existing facilities to the new/modified configurations to support the new TISC tolling solutions with minimal to no interruption to production tolling operations. It is envisioned by SRTA that this will start with establishing a parallel network for each toll facility pair.



No.	Requirement
	The Network Transition Plan shall include the detailed plan for every phase of the transition for every facility to be transitioned (i.e., 75A/B, 85A/B).
	The Network Transition Plan shall explain in detail for each existing TSI toll facility (i.e., 75A/B, 85A/B) the phasing of the network transition enabling the TFH to perform as the revenue system of record.
	The Network Transition Plan shall explain in detail for each existing TSI toll facility (i.e., 75A/B, 85A/B) the phasing of the network transition enabling communications during and after the conversion of the roadside system to the TISC-provided roadside system.
	The Network Transition Plan shall provide a detailed description of how the network will enable transactions from SRTA's legacy Toll Points (or Legacy TFH) to be routed to the TISC's Transaction Converter (see section below) for consumption by the TISC-provided TFH.
	The Network Transition Plan shall provide a detailed description of how the network will enable roadway reversal notifications to be sent from the TISC's Transaction Converter to the existing TSI I-75 toll zone controllers.
	The Network Transition Plan shall include a Network Transition Schedule that identifies every key milestone for the network transition for every existing toll facility (i.e., 75A/B, 85A/B) to include network equipment installation, configuration, pre-test, formal test, decommission if required, and all other milestones necessary to demonstrate a valid and complete schedule.
	The Network Transition Plan shall include a step-by-step flowchart of how, when, and why in the transition process the existing SRTA MAN/LAN networks will be modified.
	The Network Transition Plan shall include a network architecture diagram overlaid with associated data flow diagrams for all phases of the network transition, from start of the first toll facility to acceptance of all I-85 and I-75 transitioned facilities.
	The TISC shall include with the network architecture an IP scheme using SRTA's existing and approved IP Addressing Standards, VLANs, and nomenclature.
	The network architecture diagrams included in the Network Transition Plan shall clearly identify new network equipment to be connected to the existing SRTA MAN/LAN networks.
	The network architecture diagrams included the Network Transition Plan shall identify network equipment to be decommissioned from the existing SRTA MAN/LAN networks.
	The Network Transition Plan shall document all coordination required with the existing tolling system integrator and the timing of the required coordination.
	The Network Transition Plan shall include the plan and schedule for execution of network tests in addition to the Network Test defined in Section 4.8.1: ETCS System Testing that demonstrate the integrity of the legacy toll system in each instance when modifications are made to the toll system network in support of transition activities.
	The Transition Plan shall define responsibility for performance and maintenance of the existing network.
	The Network Transition Plan shall be approved by SRTA prior to the start of any network transition activities for any facility.

#### 4.7.2 Installation Plan

The TISC shall prepare and submit to SRTA an Installation Plan.

No.	Requirement
	The TISC shall submit an Installation Plan to SRTA for review, comment, and approval before the start of any installation activities.
	The Installation Plan shall describe the installation approach, including the timing for the installation, and integration of all systems.
	The Installation Plan shall include the preparation of Installation Readiness Assessments that include the use of the risk matrix to identify risks, assess the probability of those risks, and propose mitigation or elimination strategies.
	The Installation Plan shall include an organization chart defining key team personnel roles, responsibilities, and contact information for the installation team. All installation subcontractors shall be identified in the organization chart.
	The Installation Plan shall include an installation schedule detailing all activity, order of activities, anticipated durations, shifts, dependencies, predecessors, successors, and resources for the installation of the ETCS, including any third-party or civil contractor activities.
	The Installation Plan shall include a list of installation tasks that will be performed during the implementation and include a Work Breakdown Structure (WBS) for the installation tasks of all involved parties.
	The Installation Plan shall describe the approach and procedure for daily record keeping which identifies at a minimum, the date, location, staff on site, tasks completed, visitors, traffic control, issues and resolutions, and communication to other parties for any installation activities for all phases of the Work.
	The Installation Plan shall include how the TISC will manage delivery, staging, pre-assembly, and testing performed at the TISC or third-party facilities.
	The Installation Plan shall define the process by which the final component list installed at each location is recorded and placed into the inventory management system.
	Installation Plan shall outline the TISC process to ensure As-built drawings are accurately created for each toll site.
	The Installation Plan shall define the testing process, quality control and quality assurance implemented during installation efforts.
	The Installation Plan shall include and define testing of the TISC-provided LAN and WAN communications for connection to the TFH and the CBO.
	The Installation Plan shall describe all monitoring and production verification tasks to ensure all systems are operating efficiently and as expected and that all data is properly mapped to the TFH.
	The Installation Plan shall define incident management procedures for post installation. These procedures shall include a daily report of all open incidents/ MOMS tickets, their statuses, and next steps to resolve, escalation procedures, and how SRTA and its representatives can access and monitor post installation.

No.	Requirement
	The TISC shall schedule and attend weekly installation meetings during the installation phase. TISC and all subcontractors shall ensure that appropriate personnel are present at these meetings.
	TISC shall submit to SRTA for review and approval all shop drawings detailing the installation design to be used for all installation activities.
	Documents requiring engineering approval (with Georgia PE stamp) shall be submitted to SRTA and GDOT for review.

#### 4.7.3 Site Installation Checklist (SIC)

This section details the responsibilities and requirements for the use and completion of the SIC. As part of the installation process, SRTA reserves the right to conduct a joint on-site inspection for all toll sites. SRTA will utilize and complete the approved SIC as part of the inspection and verification process.

No.	Requirement
	The TISC shall develop and submit a detailed Site Installation Checklist for review and approval. A SIC shall be developed for each toll type.
	The SIC shall identify all non-conformance, discrepancies, and exceptions.
	The SIC shall include a detailed component list and description of how each device/item is installed.
	The SIC shall include columns for manufacturer, model number, serial number, asset number, OS, or Release number (for firmware, if required) for comparison with design documentation, MOMS, and product specific cut sheets, at a minimum.
	The SIC shall be maintained by the TISC and available upon request.
	Prior to any SRTA inspections, the TISC shall submit a completed and signed SIC attesting to the completeness of the installation at each Toll and ITS site.
	Upon SRTA receipt of notification of a fully installed site, the TISC shall schedule a SRTA inspection at each toll site.
	TISC shall notify SRTA a minimum of seven (7) days prior to site inspections.
	The TISC shall ensure a TISC representative who has knowledge of each Toll and ITS site and is well versed on the SIC details is present with SRTA for each site inspection.

#### 4.7.4 Installation Coordination with SRTA/GDOT

The TISC shall coordinate with SRTA and SRTA subcontractors as well as GDOT and GDOT subcontractors and existing toll system providers and their subcontractors.

Coordination shall be achieved by applying the procedures described in the Communication Management Plan.

#### 4.7.5 Installation Meetings

During the installation process, the TISC shall organize and coordinate regular, pre- and post-installation meetings.

##### 4.7.5.1 Regular Installation Meetings

The TISC shall organize and coordinate regular monthly Installation Meetings.

No.	Requirement
	The TISC shall organize and coordinate regular Installation meetings once every month during the entire period when installation works are performed.
	The TISC shall ensure meeting attendees include at a minimum: SRTA and/or SRTA designated representative, TISC Installation Manager, TISC Health and Safety Manager, TISC involved subcontractors, GDOT and/or involved GDOT subcontractors.
	The TISC shall ensure the meeting agenda includes review of schedule, health and safety procedures, methods and procedures related to installation work to be performed including coordination tasks.
	The TISC shall ensure that regular Installation Meeting minutes are distributed to all participants and involved parties one (1) day after the meeting.

##### 4.7.5.2 Pre-Installation Meetings

The TISC shall organize and coordinate Pre-Installation Meetings prior to every major or recurrent installation event before starting work at any Section to verify compliance with Project and Contract requirements.

Below are the requirements for the Pre-installation Meetings:

No.	Requirement
	The TISC shall notify attendees one (1) week prior to meeting.
	The TISC shall ensure that the meeting takes place not more than three (3) working days before the event.
	The TISC shall ensure meeting attendees include at a minimum: SRTA and/or SRTA designated representative, TISC Installation Manager, TISC involved subcontractors, GDOT and/or involved GDOT subcontractors.
	The TISC shall ensure the meeting agenda includes review of methods and procedures related to installation work to be performed including coordination tasks.
	The TISC shall ensure that Pre-installation Meeting minutes are distributed to all participants and involved parties before going on site.

##### 4.7.5.3 Post-Installation Meetings

The TISC shall organize and coordinate Post-Installation Meetings after every major or recurrent installation event to verify successful conclusion.

Below are the requirements for the Post-installation Meetings:

No.	Requirement
	The TISC shall organize the meeting within three (3) working days after conclusion of the installation event.
	The TISC shall ensure meeting attendees include at a minimum all attendees of the respective Pre-installation Meeting.
	The TISC shall ensure the meeting agenda includes review of issues encountered during the event and proposed corrections and improvements of methods and procedures followed.
	The TISC shall ensure that Post-installation Meeting minutes are distributed to all participants and involved parties one (1) day after the meeting.

## 4.8 Testing and Related Documentation

### 4.8.1 ETCS System Testing

As this is a brownfield project requiring a seamless transition from two operational toll systems into the ETCS, diligent testing is of outmost importance. Testing shall be designed and managed by the TISC Test Director.

This section details the general testing requirements for the ETCS, including all associated interfaces and end-to-end functionality. This section also includes test phases, facilities, and support services. These general testing requirements apply to all ETCS toll facilities unless otherwise noted below.

The timeframe for submitting the Test Plans required by this RFP to SRTA for review, comment, and approval is defined in the detailed requirements tables below. Before the start of each test phase, SRTA will review the applicable Test Plans and procedures, providing detailed comments on the nature and extent of any deficiencies.

In the following sections identifying the specific system tests to be conducted, the term Verify means to confirm the ETCS meets all its contractual requirements, while the term Validate means to confirm the ETCS meets the operational needs of SRTA.

The overall System Testing requirements include the following:

No.	Requirement
	The TISC shall conduct testing of the ETCS to verify and validate functionality, availability, reliability, accuracy, performance, and compliance with all the requirements of this RFP.
	Testing shall verify and validate that the ETCS system complies with all related business rules that may be defined in the Business Rules document to be approved by SRTA.
	Testing shall be performed in the Test Environment to be deployed as defined and described in Section 2.2.4.5: Additional TFH System Instances.
	The TISC shall receive SRTA approval of the Master Test Plan prior to submitting subsequent Test Plans.

No.	Requirement
	The TISC shall receive SRTA approval of all Test Plans, Test Procedures, and Test Cases for all required test phases prior to scheduling the associated test event.
	The TISC shall provide a Test Director who is accountable for the entire Test Program for all ETCS facilities.
	The TISC shall be responsible for working with all appropriate entities to schedule and perform all required testing.
	Any changes to requirements implemented before Final System Acceptance due to design updates, specification updates, change orders, and/or break/fix activities shall be tested against all test phases of this RFP.
	The TISC shall use a test management system (JIRA, Quality Center, or similar software) to support the planning, test case management, defect management, and all other testing activities as required in this section for the term of the Contract.
	The TISC shall grant read-only access to the TISC's test management tool for defect tracking (JIRA or similar software) for up to three (3) SRTA staff or representatives at the beginning of the first FAT, either TFH or Roadside, through the term of the Contract.
	In the event test failures result in re-execution of a formal test, the TISC shall be solely responsible for all costs incurred by SRTA as a result of such test failures and the consequent re-execution of tests (e.g. staff and consultant labor and expenses).

#### 4.8.2 Master Test Plan

The Master Test Plan (MTP) will serve as the standard for how all formal tests for all ETCS facilities will be conducted for the term of the Contract.

It is anticipated that as design and development activities take place, testing strategies and plans may change and require revisions. As such, SRTA may request updated versions of the MTP and related test documents (e.g., Test Plans, Test Procedures, Test Cases, and final test artifacts).

The requirements of the MTP include the following:

No.	Requirement
	The TISC shall provide a Master Test Plan for review and approval by SRTA no fewer than 120 days prior to the requested start date for TFH or Roadside Factory Acceptance Testing, whichever the TISC elects to conduct first.
	The MTP shall define the overall test program for the ETCS, and its submittal shall be included in the approved Master Project Schedule.
	The MTP shall provide the name, credentials, and contact information for the Test Director.
	The MTP shall provide the standards for developing Test Plans, Test Schedules, Test Procedures, Test Cases, and Test Results for the required formal test phases.
	The MTP shall define: <ol style="list-style-type: none"> <li>1. How each formal test phase will be conducted.</li> </ol>

No.	Requirement
	<ol style="list-style-type: none"> <li>2. How Test Procedures and Test Cases will be defined and described by test phase, including indicating which will be used and if it will be used in multiple test phases with different data.</li> <li>3. Whether or not any simulator will be used in each test phase.</li> <li>4. The tracking process for discrepancies, issues, and defects.</li> <li>5. Descriptions of the Severity Levels to be assigned to any issues discovered during testing.</li> <li>6. The process for resolving issues and defects.</li> <li>7. The entry and exit criteria that must be met for each formal test phase.</li> <li>8. The acceptance criteria for each formal test phase.</li> <li>9. The guidelines and format for creating Test Cases in the individual Test Procedures.</li> <li>10. The test roles and responsibilities.</li> <li>11. Test Results and reporting.</li> </ol>
	<p>The MTP shall describe the test management system, including associated tools and procedures, that will be utilized for testing.</p>
	<p>The MTP document shall refer to the following Severity Levels and associated descriptions for all test phases (Severity Level 1 – Highest severity, Severity Level 4 – Lowest severity).  <i>Note: The overall severity of a test failure shall be classified according to the characteristic of the highest Severity Level associated to the test failure.</i></p> <ol style="list-style-type: none"> <li>1. Severity Level One (S1) - A defect that stops the execution of an individual test and causes the related tests not to be executed. This class of defect is reserved for problems that are showstoppers (testing is stopped) and shall be used only for the most critical of defects. Typical characteristics of this class of defect include: <ol style="list-style-type: none"> <li>a. The defect is related to a legal or revenue issue that must be resolved before deployment. The system cannot go into production until the defect is fixed.</li> <li>b. The defect will result in a customer-facing issue for SRTA.</li> <li>c. The defect will directly impact users or operations in a major, noticeable way.</li> <li>d. The defect occurs (or will occur once the application is released) quite often (daily, usually) in actual production or simulation.</li> <li>e. There is no real workaround.</li> <li>f. The defect causes downtime to the point the applicable availability SLAs is not able to be met.</li> </ol> </li> <li>2. Severity Level Two (S2) – A defect that stops the execution of an individual test but does not affect the execution of other related tests. This may also be a defect that blocks any test or presents an unavoidable problem, preventing a user from completing the required tasks. Typical characteristics of this class of defect include: <ol style="list-style-type: none"> <li>a. The defect directly impacts users, or operations, in a major, noticeable way.</li> <li>b. The defect occurs (or will occur once the application is released) often (at least once a week) in actual production or in simulation.</li> <li>c. The defect causes application downtime or blocks tests/test sets.</li> <li>d. There is no workaround, or there is only one workaround that requires significant effort on the part of the user.</li> </ol> </li> </ol>

No.	Requirement
	<p>3. Severity Level Three (S3)– A defect for which a workaround is available. The actual results of current tests are not as expected, but the defect does not prevent the continued execution of the test itself or related tests. Includes defects that impact the system or subsystem, but the system or subsystem is still able to perform without an immediate fix. Typical characteristics of this class of defect include:</p> <ul style="list-style-type: none"> <li>a. The defect occurs (or will occur once the application is released) less often than weekly in actual production or simulation.</li> <li>b. The defect does not cause significant application downtime.</li> <li>c. The system/subsystem is not functioning as documented or expected.</li> </ul> <p>4. Severity Level Four (S4) – A cosmetic defect whose occurrence does not indicate a lack of or deviation from required functionality, but a cosmetic change or enhancement is requested. Workarounds are available so that these defects can be avoided by system users. Typical characteristics of this class of defect include:</p> <ul style="list-style-type: none"> <li>a. The defect relates to content, documentation, or other "non-application" aspects of the system or subsystem.</li> <li>b. If functionally related, the defect seldom occurs (or seldom will occur once the application is released) in actual production or in simulation.</li> <li>c. Users have not noticed, or are unlikely to notice, that there is a defect.</li> </ul>
	The TISC shall use the then current SRTA-approved MTP as the plan for all testing performed for the term of the Contract.

#### 4.8.3 Test Plans

Test Plans document the strategy that will be used to verify and ensure the ETCS meets the requirements of this RFP. The requirements for Test Plans are as follows:

No.	Requirement
	The TISC shall develop a Test Plan for each of the formal test phases described in section 4.8.5 for SRTA review, comment, and approval.
	Each project test plan shall be delivered to SRTA no less than 90 days before the start of its related formal test.
	<p>All Project Test Plans shall include:</p> <ul style="list-style-type: none"> <li>1. Description of how the TISC will demonstrate that all requirements assigned to the formal test phase covered in the Test Plan have been met.</li> <li>2. Description of how and where the formal test will be conducted.</li> <li>3. Required test roles and responsibilities, including 3rd party support roles.</li> <li>4. The anticipated schedule for the formal test, including the sequence and projected duration of each test.</li> <li>5. Sample reports that will be used for data validation and demonstration of system availability, accuracy, and performance, if tested during the test phase covered by the Test Plan.</li> <li>6. Additional reports testing.</li> </ul>



No.	Requirement
	<ul style="list-style-type: none"> <li>7. Descriptions of the TISC-provided test environments.</li> <li>8. Entry and exit criteria for the formal test.</li> <li>9. Identification of the test procedures to be conducted as described in the following section 4.8.4: Test Procedures.</li> <li>10. Descriptions of test data sets used for reports and functional testing.</li> <li>11. Description of the process for recording and correcting any defects noted during the formal test.</li> <li>12. Description of any test system/ arrangement that will be used during testing.</li> <li>13. Description of any simulator that will be used during testing.</li> <li>14. Description of the Traffic Control Plan, if required.</li> <li>15. Description of regression testing required to implement fixes.</li> <li>16. Description of the process to document test results, create a test report and obtain approval from SRTA.</li> </ul>
	For all Test Plans, the TISC shall provide updates as required by changes in the design and/or the software, until all testing steps/cycles related to a Test Plan have been successfully completed.

#### 4.8.4 Test Procedures

Test procedures correlate with the requirements being demonstrated during a test phase. Requirements for Test Procedures are as follows:

No.	Requirement
	The TISC shall provide Test Procedures for all required Test Plans.
	<p>Test procedures shall include the following elements:</p> <ul style="list-style-type: none"> <li>1. Introduction <ul style="list-style-type: none"> <li>a. Test Purpose.</li> <li>b. Test Platform (including required equipment, environmental resources, and connectivity).</li> <li>c. Test Personnel and their roles.</li> <li>d. Requirements to be demonstrated (cross reference to lowest level requirement).</li> <li>e. Time Estimate to conduct the test.</li> <li>f. Pre-requisites for execution of the test.</li> <li>g. Set-up and test data preparation required.</li> </ul> </li> <li>2. Individual Test Conditions/Cases: <ul style="list-style-type: none"> <li>a. Test Case Name (identified using active language e.g., "Check User Logic with valid Data").</li> <li>b. Reference to specific requirement being tested.</li> <li>c. Description of steps to execute the test case.</li> <li>d. Expected Results.</li> </ul> </li> </ul>

No.	Requirement
	e. Provision for recording Actual Results and parties responsible for test case execution and approval (entered after test execution). f. Notes. 3. Test Data Generation and Management: a. Identification of any simulated testing and methodology.
	The TISC shall submit all test procedures for formal tests to SRTA for review, comment, and approval no less than 90 days before the start of the related formal test, unless otherwise noted in this RFP.
	The TISC shall add test case results to the MTP as addendums.

#### 4.8.5 Overview of Formal Test Phases

System Testing for SRTA ETCS facilities includes numerous formal test phases and associated milestones for the existing toll facility pairs:

1. Factory Acceptance Test (FAT):
  - a. Toll Facility Host FAT.
  - b. Roadside FAT.
2. Network Connectivity Test for each Facility Pair.
3. TFH Revenue Ready Test (RRT) for each Facility Pair.
4. First Site Integration Test (FSIT) for the first roadside installation of each Facility.
5. Site Commissioning Tests (SCT) for all remaining sites in each Facility.
6. Operational Acceptance Test (OAT) per Facility Pair.

The relationships, sequence and timing of these tests are shown in the following figure.

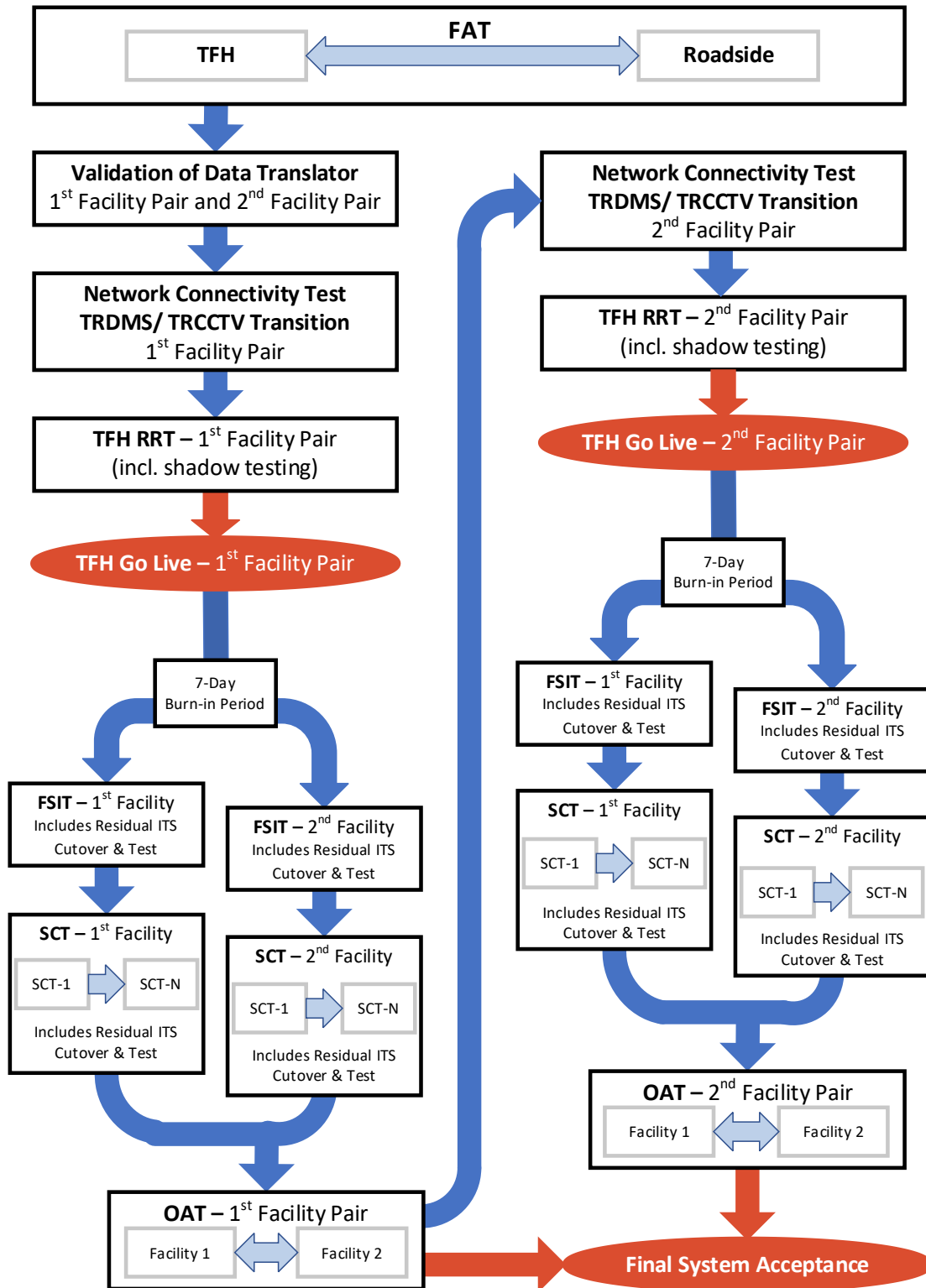


Figure 15: High level view of Testing Phase Sequence

SRTA will review and approve Test Plans, Test Procedures, and Test Cases along with testing schedules proposed by the TISC. All formal tests will be witnessed by SRTA or its designated representatives in accordance with the Master Test Plan, the approved Test Plans and the Master Project Schedule.

For all tests involving the test and verification of the transaction processing of the Zone Controllers, SRTA will provide transponders to be used for testing including Peach Pass and interoperable transponders.

The test phase requirements include the following:

No.	Requirement
	The TISC shall demonstrate to SRTA the ETCS meets all requirements by executing formal tests on each toll facility.
	The TISC is solely responsible to conduct and record all formal tests in accordance with the approved Test Plans and Procedures. At its discretion, SRTA may witness and report defects during formal tests.
	Except for the Network Connectivity Test, First Site Integration Test (FSIT), Site Commissioning Test (SCT) and Operational Acceptance Test (OAT), prior to a formal test, the TISC shall follow the applicable SRTA-approved Test Plans and Procedures to conduct internal pre-tests (i.e., dry runs of the tests) to verify both system test readiness and the accuracy and completeness of the test plans and procedures.
	Each pre-test shall be conducted in the same environment and configuration as the formal test it precedes.
	The TISC shall provide the results of the internal pre-tests to SRTA prior to commencement of the formal test.
	Internal pre-tests shall be successfully completed by the TISC no less than three weeks before the request to schedule the associated formal test.
	With a SRTA-approved pre-test for the formal test, and for every formal test except the First Site Integration Test (FSIT) and SCT, the TISC shall conduct a Test Readiness Review (TRR), to review the approach to test execution, identify any deficiencies or issues, to ensure the entry criteria is met, and to gain SRTA's approval to proceed.
	The TISC shall provide a completed TRR Checklist in the request to schedule a TRR.
	<p>The TRR shall include the following, at a minimum:</p> <ol style="list-style-type: none"> <li>1. Test documentation from the pre-test of the formal test to include all Test Cases and results (if applicable).</li> <li>2. Identification of all defects from the pre-test.</li> <li>3. Identification of any test cases omitted from the pre-test and the reason for the omission.</li> <li>4. Schedule of events for the formal test.</li> <li>5. Resource loaded test schedule in MS Project and in pdf format.</li> <li>6. Confirmation of availability of all SRTA resources required.</li> <li>7. List of entry criteria and status.</li> </ol>
	The TISC shall conduct all tests in accordance with the SRTA-approved Master Project Schedule, Test Plans, Test Procedures, and Test Cases.

No.	Requirement
	For all formal tests, except for TFH FAT and the Roadside FAT, Pass/Fail test results shall be based only on ETCS data generated during the approved test period except as specifically approved by SRTA. If simulated or pre-recorded data is required to verify a specific requirement, the data to be used, including an explanation of why this data is needed, shall be identified in the relevant test procedures.
	<p>The TISC shall provide the following in accordance with the SRTA-approved Master Test Plan:</p> <ol style="list-style-type: none"> <li>1. Test roles and responsibilities.</li> <li>2. All image review labor, test support staff, and other support labor.</li> <li>3. Test vehicles and drivers.</li> <li>4. Test equipment.</li> <li>5. Test sites for TFH and Roadside FAT.</li> </ol>
	The TISC shall identify the required system configurations and ensure proper configuration for both development and test equipment as necessary to conduct the pre-test and formal tests.
	The TISC shall document all defects and issues discovered during formal tests in their test management tool.
	In the event there are failures during any formal test, the TISC shall rerun the applicable portion of the test, including other test cases affected by the failure, and/or rerun the entire test at SRTA's request and sole discretion.
	All issues and defects shall be assigned a Severity Level as defined in the Master Test Plan and a resolution date.
	The TISC shall be responsible for tracking all defects and issues found during all testing phases until resolution and validation by SRTA.
	The TISC shall provide the defects and issues list to SRTA within two (2) days of completion of the formal test.
	The TISC shall submit updates to the defects and issues list daily for all S1 and S2 defects and other defects identified by SRTA and weekly for all others.
	For S1 and S2 defects, the TISC shall conduct weekly demonstrations to show progress in correcting those defects until resolution is confirmed and validated by SRTA. If during the executing of a formal test a S1 defect, and/or an excessive number of S2 defects, is identified, SRTA reserves the right to cancel the formal test and ask the TISC to start the test over once the issues are resolved and tested by the TISC, and validated by SRTA.
	After each formal test, the TISC shall fix, test, and resolve all S1 and S2 issues to SRTA's satisfaction in each formal test before approval to progress to the next step of the Project will be granted.
	At the completion of each formal test, the TISC shall record any outstanding S3 and S4 issues in their chosen test management tool and provide SRTA with a plan for resolving those issues which will include resolution dates for each of issues.

#### 4.8.5.1 Factory Acceptance Test

Factory Acceptance Tests are to demonstrate the operation of the ETCS against the requirements prior to advancing to the approved next step of the Project. SRTA and/or SRTA-designated representatives will witness all FAT testing. In case SRTA and/or SRTA-designated representatives want to witness any pre-FAT test activities, the TISC shall allow for this by informing SRTA in advance of pre-FAT tests accordingly. FAT will be a combined test and include a TFH component and a Roadside component. If the TFH FAT component precedes the roadside FAT component, roadside transaction data and images may be provided via simulation. If the roadside FAT component precedes the TFH FAT component, the interface between the Zone Controllers and the TFH may be simulated. Successful completion of the FAT occurs when the test meets all of its defined exit criteria.

The general requirements for the FAT that apply to both the TFH FAT and Roadside FAT are as follows. Specific requirements for each individual FAT are documented in the following subsections 4.8.5.1.1 and 4.8.5.1.2.

No.	Requirement
	The TISC shall conduct a TFH FAT and a Roadside FAT to demonstrate that all functional requirements defined in the RFP have been satisfied.
	The TISC shall conduct the Roadside FAT on a TISC-provided fully operational ETCS factory test environment representative of the final deployed system.
	The TISC shall conduct the TFH FAT on a TISC-provided fully operational cloud-based factory test environment representative of the final deployed system.
	The test environment(s) shall have hardware and software that is representative of the final system in production.
	The test environment(s) shall include the exact make/model of any roadside equipment the TISC will use in the TISC tolling solution.
	The TISC shall demonstrate load tests for both the TFH FAT and Roadside FAT to verify acceptable system performance when handling transaction volumes representative of twice the expected real-world load on the system from all existing toll facilities.
	The TISC shall provide access to SRTA and SRTA-designated representatives to all FAT test sites, reports used during testing, and data generated during this testing.
	The TISC shall test and demonstrate all ETCS functionality, capacity, performance, modules, interfaces, and user interfaces during FAT.
	The TISC shall verify all required internal and external interfaces for data accuracy during FAT.
	The TISC shall verify all 3rd party interfaces during FAT. If the 3rd party is not available to support FAT testing, interface testing during FAT may be simulated with prior SRTA approval.
	The TISC shall verify user access based on the User Access Level Matrix defined in Section 2.2.5.1: TFH Connectivity and System Access during FAT.
	The TISC shall demonstrate proper transmission of test data from the roadside and TFH during FAT.
	The TISC shall demonstrate the transmission of test data in accordance with the interfaces and their respective ICDs listed here during FAT: 1. SRTA's Customer Back Office (CBO).

No.	Requirement
	<ol style="list-style-type: none"> <li>2. GDOT ATMS.</li> <li>3. SRTA's Data Warehouse.</li> <li>4. Georgia Institute of Technology Database.</li> <li>5. Managed and Tolloed Lane Feed.</li> </ol>
	The TISC shall work with SRTA's existing vendors and integrators to establish appropriate Test Procedures and test conditions such that both sides of an interface are completely tested and verified to meet requirements identified in the respective ICDs.

#### 4.8.5.1.1 Toll Facility Host (TFH) FAT

SRTA and/or SRTA-designated representatives will witness all TFH FAT testing. The requirements for the TFH FAT include:

No.	Requirement
	The TFH FAT shall demonstrate that the TFH meets all requirements when consuming transactions from both toll facility pairs, I-75 and I-85.
	The TISC shall provide baseline operational and performance reports during the TFH FAT to verify the ETCS meets system requirements.
	The TISC shall conduct the TFH FAT at a TISC test facility.
	The TISC shall establish the necessary environment to allow remote participation to the FAT by SRTA and/or its representative upon SRTA request.
	To test the TFH Transaction Converter, the TFH FAT shall use simulated data for legacy toll transactions. Simulated transactions may be created by the TISC using the legacy ETCS ICD or may be a stream of legacy transactions captured from the existing roadside and fed into the TFH during the FAT.
	The TISC shall conduct the TFH FAT using either live data generated by the TISC roadside system or simulated data created by TISC using the TISC ETCS ICD.
	The TISC shall configure all the roadway and system parameters at least five (5) days before FAT.
	<p>The TFH FAT demonstration shall demonstrate the following functionalities:</p> <ol style="list-style-type: none"> <li>1. Transaction converter is functioning as required for both toll facility pairs.</li> <li>2. CPS properly schedules and publishes time of day rates to the TRDMS or TRDMS simulator.</li> <li>3. CPS calculates dynamic rates using real-time traffic data and posts them to the TRDMS or a TRDMS simulator.</li> <li>4. Internal and external interfaces demonstrate successful transmission and acknowledgement of accurate data.</li> <li>5. Trips are correctly built and dispositioned.</li> <li>6. TFH can communicate with GDOT's ATMS (or an ATMS simulator) to change the direction of travel at toll points for reversible roadways.</li> <li>7. TFH can access, search, and control video from CCTV cameras.</li> </ol>

No.	Requirement
	<p>8. The TOCS correctly interfaces with the ETCS and accurately displays all required ETCS information.</p> <p>9. IPS assigns an image review result to all images and transfers transactions with all image-related data to Trip Building.</p> <p>10. IAS allows users to create, schedule, and manage Audit Sets.</p> <p>11. IAS allows users to conduct audits on assigned Audit Sets.</p> <p>12. Audit system demonstrates the ability to track transactions and trips as they are processed in the ETCS.</p> <p>13. MOMS monitors host systems equipment and applications, tracks and reports on work orders, creates and handles alert messages, and manages equipment inventory and health.</p> <p>14. All TFH email and SMS notifications are sent at the correct time to the correct recipients.</p> <p>15. TFH report generation.</p> <p>16. Vehicle Lists are configurable and trigger the desired event associated with each vehicle list type.</p> <p>17. User Interfaces look and function as designed.</p> <p>18. Demonstration of TFH reports as needed to support FAT test results.</p> <p>19. Demonstration of all other reports showing sufficient content for verification of the completeness and accuracy of the reported data.</p> <p>20. Demonstration of reporting system capabilities as specified in this RFP.</p> <p>21. Any requirement allocated to the TFH FAT test phase as identified in the MTP, the FAT Plan, and the RTM.</p>
	The TISC shall receive approval of the TFH FAT prior to any roadside installation commencing.

#### 4.8.5.1.2 Roadside FAT

The requirements for the Roadside FAT are as follows:

No.	Requirement
	The TISC shall conduct a single Roadside FAT for all site types for both toll facility pairs.
	The TISC-provided test facility shall be configurable to demonstrate all site types on I-75 and I-85.
	The TISC shall conduct the Roadside FAT at a TISC-provided test track that provides for testing with vehicles driving through toll sites.
	The TISC shall conduct the Roadside FAT using live data to the fullest extent possible. Simulated data may only be used if pre-approved by SRTA.
	The TISC shall provide an installation verification checklist document to SRTA for use in verifying that all installed system components (hardware and software) match appropriate design documentation for FAT.



No.	Requirement
	The TISC shall provide the installation verification checklist to SRTA for review before the start of the roadside FAT. FAT cannot begin without verification against all equipment and software installed/configured at the test track for FAT.
	<p>The Roadside FAT shall include a demonstration of the following functionality:</p> <ol style="list-style-type: none"> <li>1. Zone controller redundancy and failover are seamless, with no potential loss of revenue.</li> <li>2. Zone controllers build transactions according to design requirements.</li> <li>3. Zone Controller transactions include all required data elements.</li> <li>4. Transactions from the roadside are transmitted successfully to the TFH.</li> <li>5. AVI systems properly read Peach Pass and interoperable transponders which are then correlated with the correct vehicle.</li> <li>6. AVDC systems properly detect, separate, and classify all vehicles.</li> <li>7. Roadside system properly detects, correlates, and separates vehicles under various traffic conditions including, at a minimum: high speed, closely following high speed and low speed, stop and go with multiple vehicles, vehicles straddling lanes and shoulders, and vehicles weaving between lanes and shoulders.</li> <li>8. VES cameras are properly aimed, focused, and triggered. Images are captured for all vehicles, including vehicles with Peach Pass and interoperable transponders. VES images captured during day and night are in focus, include a human readable license plate, and the image set includes and ROI image.</li> <li>9. DVAS CCTV cameras are properly aimed, focused, and have adequate frame rates.</li> <li>10. DVAS video recording and playback meets design requirements for live and historical playback.</li> <li>11. DVAS transactional data overlay meets design requirements.</li> <li>12. TRDMS CCTV cameras are properly aimed, focused, and have the required frame rates.</li> <li>13. TRDMS video recording and playback meets design requirements for live and historical playback.</li> <li>14. The TRDMS or TRDMS simulator displays the correct rates.</li> <li>15. The TRDMS or TRDMS simulator displays the correct destinations (applicable to reversible facilities).</li> <li>16. The TRDMS allows users to publish alphanumeric messages to the sign.</li> <li>17. UPS systems are operational and meet design requirements.</li> <li>18. Direction of travel can be reversed on reversible facilities.</li> <li>19. Traffic sensors are measuring volume and speed correctly.</li> <li>20. Any requirement allocated to the FAT test phase as identified in the MTP, the FAT Plan, and the RTM.</li> </ol>
	The TISC shall receive SRTA approval of the Roadside FAT prior to the commencement of any roadside installations at any facility.

#### 4.8.5.2 Network Connectivity Test

The TISC will be required to perform a Network Connectivity Test to be completed no later than 3 weeks before the start of the first TFH RRT. This Network Connectivity Test will demonstrate how the TISC plans

to replace certain elements of the existing network infrastructure with no negative impact on the legacy network and without disrupting current revenue collection. The Network Connectivity Test will be limited to certain networks and ITS infrastructure elements on the planned first facility installation. Specifically, the TISC Network Connectivity Test must address hub switch connectivity, TRDMS and TRCCTV cameras switch connectivity, TRDMS connectivity and control, TRCCTV camera connectivity and control, and related VLAN assignments. The Network Connectivity Test must address the required replacement of all switches, signs and TRCCTV cameras with new equipment as required elsewhere in this RFP. Scheduling of tests must take into consideration available times when work is permitted on the chosen facility as well as times of minimal revenue generation. Because the network infrastructure differs significantly between the facility pairs, the TISC will need to conduct a second Network Connectivity Test on the network for the second facility pair. Note, while the ETCS switches belong to SRTA, the fiber infrastructure up to demarcation points shown in the available documentation is owned by GDOT. GDOT is solely responsible for repairs to the fiber trunk.

Specific requirements for the network test are as follows:

No.	Requirement
	The TISC shall conduct a Network Connectivity Test to verify network connectivity between their newly installed Hub, TRDMS, and TRCCTV camera switches and their TFH or other monitoring endpoint(s).
	The Network Connectivity Test on the first road in the first facility pair shall be completed no later than 3 weeks before the first TFH Revenue Ready Test.
	TISC shall be responsible for reviewing any network documentation provided by SRTA to verify its accuracy including spare fiber availability and viability, switch configuration, port assignments and VLAN organization and assignments.
	The TISC shall be responsible for conducting any inspections or tests they require to verify the suitability of spare fiber for use if that is their planned approach to verifying connectivity. SRTA will provide the results of any tests they may have independently conducted on the spare fiber.
	The TISC shall be responsible for terminating any spare fiber planned for use in the network test, if needed.
	The TISC shall document any fiber defects or issues discovered so that SRTA may advise GDOT of the deficiencies.
	The TISC shall provide a Network Test Plan and Network Test Procedures for SRTAs review and approval no later than 60 days before the planned start of the first Network Connectivity Test.
	<p>The Network Connectivity Test Plan shall include the following information:</p> <ol style="list-style-type: none"> <li>1. Implementation of the TISC's proposed VLAN design for the items to be tested.</li> <li>2. Switch IP address and port assignments.</li> <li>3. Approach for installing and testing Hub network switches without disrupting the existing legacy network connectivity.</li> <li>4. Approach for installing new TRDMS and TRCCTV switches without disrupting the existing legacy network connectivity including TISC's plan to install in existing or new cabinets, use dark fiber or reuse of existing fiber, or other methods to be described in detail in the plan.</li> </ol>

No.	Requirement
	<ol style="list-style-type: none"> <li>5. Identification of first site for a proof-of-concept test before beginning the entire planned network switch, TRDMS and TRCCTV camera transition.</li> <li>6. Approach for installing new TRDMS and TRCCTV cameras and connecting them to the network.</li> <li>7. Plans for fallback to the existing infrastructure if the proof-of-concept test fails.</li> <li>8. Method for posting time of day rates on the new TRDMS and verifying those rates at the signs by using the new TR CCTV cameras.</li> <li>9. Schedule for testing and transitioning all switches, TRDMS and TRCCTV cameras on the first facility in the facility pair.</li> </ol>
	<p>The Network Connectivity Test Procedures shall include the following information:</p> <ol style="list-style-type: none"> <li>1. Hub switch tests to be run and method for verifying connectivity of TISC and Legacy switches.</li> <li>2. ITS switch tests to be run and method for verifying ITS connectivity, sign control, and camera visibility.</li> <li>3. Toll rate posting and verification tests to be run and methods for verifying rates were posted or observed.</li> </ol>
	The TISC shall utilize the Network Connectivity Test Plan and Procedures, updated as applicable, for transitioning the TRDMS and TRCCTV camera equipment and switches on the second road in each facility pair.
	The Network Connectivity Test on the first facility in the second facility pair shall be completed no later than 3 weeks before the second TFH Revenue Ready Test.
	The Network Connectivity Test for the second road in each facility pair shall be conducted no later than 3 weeks before the FSIT on the second road.
	The TISC shall provide a written report providing summary and detailed results of each Network Test for SRTA's review and approval.
	SRTA or SRTA designees shall be permitted to witness the network tests.

#### 4.8.5.3 TFH Revenue Ready Test

The purpose of the TFH Revenue Ready test is to verify that the TFH is ready to become the revenue system of record. FH Revenue Ready Test will be conducted twice, once for each toll facility pair, with the second test requiring execution of fewer test procedures than the first.

With SRTA approval of the TFH Revenue Ready Test and when all applicable entry/exit criteria are met, the TFH will go live to become the revenue system of record for a toll facility pair.

The TFH Revenue Ready test should be designed and executed to demonstrate end-to-end processes to the full extent possible.

The requirements for the TFH Revenue Ready Test include:

No.	Requirement
	The TISC shall conduct two (2) TFH Revenue Ready Tests, one for each toll facility pair, that verify all functionality and requirements are met and the TFH operates according to requirements as defined in this RFP.
	The TISC shall conduct the TFH Revenue Ready Test for the first toll facility pair after SRTA approval of both the TFH FAT and Roadside FAT.
	The TISC shall conduct the TFH Revenue Ready Test for the second toll facility pair after SRTA approval of the OAT of the first toll facility pair.
	The TFH Revenue Ready Test shall be conducted on the TISC-provided cloud-based system.
	The TISC shall perform the TFH Revenue Ready Test with production-ready hardware, software, equipment, network, and connectivity configuration.
	The TISC shall conduct the TFH Revenue Ready Test using live production data generated by the existing TSI roadside systems for the pair of roads covered in the test and passed to the TISC's TFH through the TFH Transaction Converter described in Section 3.3: Toll Facility Host (TFH) Transaction Converter.
	<p>The TFH Revenue Ready Test shall verify the following:</p> <ol style="list-style-type: none"> <li>1. CPS properly schedules and publishes time of day rates to the TRDMS.</li> <li>2. CPS calculates dynamic rates using real-time traffic data.</li> <li>3. Internal and external interfaces demonstrate successful transmission and acknowledgement of accurate data per the approved ICDs, to include User, CBO, GDOT ATMS, TOCS, and any ITS equipment transitioned to the TISC network.</li> <li>4. Users access permissions based on the User Access Matrix.</li> <li>5. Transaction converter is functioning as required for the toll facility pair being tested.</li> <li>6. Trips are correctly built, posted to the CBO, and reconciled based on SRTA Business Rules using transactions collected from the pair of roads being tested via the transaction converter.</li> <li>7. TFH can communicate with GDOT's ATMS and change the direction of travel for reversible roadways.</li> <li>8. TFH can access, record, playback, and control video from CCTV cameras.</li> <li>9. The TOCS accurately displays all required ETCS information as described in Section 2.2.5.17: Toll Operation Center Application.</li> <li>10. Image Processing System assigns an image review result to all images and transfers transactions with all image-related data to Trip Building.</li> <li>11. Image Auditing System allows users to create, schedule, and manage Audit Sets and to conduct audits on assigned Audit Sets.</li> <li>12. Audit system demonstrates the ability to track transactions and trips as they are processed in the ETCS.</li> <li>13. TFH, CPS, Trip, and IPS reports and dashboards.</li> <li>14. Operational and Transition Level Performance reporting.</li> <li>15. MOMS monitors TISC network, transitioned ITS equipment, and host systems equipment and applications; tracks and reports on work orders; creates and handles alert messages; and manages equipment inventory and health.</li> <li>16. All TFH alerts and notifications are sent at the correct time to the correct recipients.</li> </ol>

No.	Requirement
	17. All data validation checks are performing as required with appropriate codes/messages. 18. Vehicle Lists are configurable and trigger the desired event associated with each vehicle list type. 19. User Interfaces look and function per the approved design. 20. System Operations to include: <ul style="list-style-type: none"> <li>a. Redundancy and Failover.</li> <li>b. Security.</li> <li>c. System Backup.</li> <li>d. Disaster Recovery.</li> </ul> <i>(NOTE: Depending on TFH Design, certain items may need to be verified only during the TFH RRT for the first Facility Pair.)</i>
	After the completion of the scripted RR tests, the TISC shall execute a seven (7) day burn in test during which SRTA will observe and monitor TFH operations.
	The TISC shall submit a detailed list of trips that will be tested and the quantity of each to test all permutations (combinations of entry and exits) during both the required pre-tests and the formal test.
	The TFH shall Go Live and become the revenue system of record for a toll facility pair once all applicable entry/exit criteria as defined in Section 4.8.6: Entry Exit Criteria have been satisfied for the RRT for a toll facility pair.
	For each toll facility pair, with SRTA approval of the TFH Revenue Ready Test and of Go Live of the TISC TFH, the TISC shall conduct a burn-in period of the TFH as the revenue system of record for seven (7) consecutive days. During the burn-in period, no system changes shall be made. Major system or functional issues shall result in a restart of the seven (7) consecutive day burn-in period.

#### 4.8.5.4 Testing of Roadside Sites

A First Site Integration Test (FSIT) or a Site Commissioning Test (SCT) is required for every site within each toll facility. Both the FSIT and the SCT are to be conducted using the FSIT Plan and Procedures approved by SRTA. The FSIT/SCT Plans and Procedures will address the specific tests to be conducted, including repeating the functional tests previously conducted at the roadside FAT and any functional tests that were not included in the roadside FAT. FSIT/SCT will not be expected to verify roadside performance SLAs or any roadside requirements verified by inspection or analysis, excluding inspections addressed by an installation check list.

Before starting any FSIT or SCT testing activity, the TISC will be requested to certify in writing to SRTA in a General Letter of Existing Equipment Acceptance (GLEEA) that the ECTS with the incorporation of any reused equipment, and SRTA infrastructure, at the site to be tested will meet the Project SLAs as described in Appendix E: Service Level Agreements.

Each toll site will be placed into revenue generation upon SRTA-approval of its FSIT or SCT.

The FSITs and SCTs for all sites within a facility pair must be conducted and approved before OAT for that facility pair can begin.

The following sections describe the requirements of the FSIT and SCT.

#### 4.8.5.4.1 First Site Integration Test

A FSIT is required to be conducted and approved at each facility prior to installation and SCT commencing for any other sites within that facility. SRTA may request additional sites to be included in the FSIT. This test should be designed and executed to demonstrate end-to-end processes to the full extent possible.

The requirements for the First Site Integration Test are as follows:

No.	Requirement
	The TISC shall conduct a First Site Integration Test (FSIT) for the first installation of each site type and any other sites as requested by SRTA.
	The TISC shall receive SRTA approval of the results reported on the Site Installation Checklist (SIC) prior to conducting the FSIT at the site.
	The TISC shall conduct an FSIT only at locations where a complete set of hardware, software, and communications equipment is installed as well as each type of ITS located in close proximity to the FSIT Toll Point, as applicable, and if the ITS equipment has not been previously tested.
	The TISC shall conduct individual equipment and component tests on all equipment at the installed site prior to conducting the FSIT.
	The TISC shall integrate all equipment and components, to include the TFH, at the installed site to be tested after individual tests have been conducted successfully and prior to conducting the FSIT.
	The FSIT shall verify all Tolling and ITS equipment, devices, electronics, and infrastructure are installed and operating per the requirements of the RFP.
	The FSIT shall include testing of all individual equipment and components, integration of all subsystems, testing of the integrated subsystems, and testing of communications with the TFH.
	FSIT Plans and Procedures detailed test cases shall be tailored by site type, as applicable.
	<p>The FSIT shall test the following capabilities:</p> <ol style="list-style-type: none"> <li>1. AVI Transaction Generation.</li> <li>2. Video Transaction Generation.</li> <li>3. Image Capture and review.</li> <li>4. Vehicle Classification.</li> <li>5. Vehicle Detection and Separation.</li> <li>6. Stand Alone Operations.</li> <li>7. Resending transactions.</li> <li>8. UPS Operations.</li> <li>9. Toll Point Initialization.</li> <li>10. Lane reversal (as applicable).</li> <li>11. Device monitoring and status reporting.</li> <li>12. Wrong Way Vehicle Detection.</li> <li>13. Zone Controller failover.</li> <li>14. Site-specific MOMS installation and monitoring.</li> </ol>

No.	Requirement
	15. TRDMS access and control (if not previously or separately tested). 16. CCTV camera access and control (If not previously or separately tested). 17. Traffic sensor interface and data generation (If not previously or separately tested). 18. GP lane AVI reader interface and data generation (if not previously or separately tested). 19. Network installation and configuration (if not previously or separately tested).
	The TISC shall receive SRTA approval of an FSIT before progressing to installation and SCTs of any other locations within a toll facility.

#### 4.8.5.4.2 Site Commissioning Test

The requirements for Site Commissioning Test (SCT) are as follows:

No.	Requirement
	The TISC shall conduct an SCT at every site within each toll facility pair where an FSIT has not been conducted.
	Each SCT shall be conducted in accordance with the approved FSIT Plans and Procedures.
	The SCT shall adhere to all requirements of the FSIT testing.
	The TISC shall receive SRTA-approval of all SCTs for a facility prior to requesting approval to progress to the next step of the Project.

#### 4.8.5.5 Operational Acceptance Test (OAT)

An Operational Acceptance Test (OAT) is the last formal test in SRTA's ETCS test program. An OAT will be conducted for each of the toll facility pairs. During the OAT, the TISC ETCS is the revenue system of record for all sites/site types in the toll facility pair. The objective of the OAT is to ensure that the ETCS (software and hardware) functions over the defined period with the required functionality, availability, accuracy, and performance.

The requirements for OAT include:

No.	Requirement
	The TISC shall conduct an Operational Acceptance Test (OAT) for each existing toll facility to validate over a full calendar month period the ETCS meets all requirements of this RFP with no Severity Level 1 or Severity Level 2 issues or faults.
	At SRTA's sole discretion, the TISC shall be required to restart the full calendar month test period upon the occurrence of a Severity Level 1 or Severity Level 2 fault during the OAT.
	The OAT shall validate the operation of all systems components and functions, including but not limited to: <ol style="list-style-type: none"> <li>1. Roadside System and network are sized, tuned, and configured to meet the requirements of this RFP.</li> <li>2. All ETCS software and hardware functions with limited manual intervention to include creation of trips, roadway reversal GUI (if applicable), and image review.</li> </ol>

No.	Requirement
	3. Interfaces demonstrate successful transmission and acknowledgement of accurate data per the approved ICDs to include User interfaces, TFH, CBO, GDOT ATMS, TOCS, ITS, SRTA Data Warehouse, GA Tech, and Toll Rate Web API. 4. Data accuracy and reconciliation to Operations. 5. Dashboards and reports. 6. Monitor and report on the Congestion Pricing System. 7. System Operations to include Maintenance Service Level Agreement (SLA) metrics defined in this RFP. 8. System accuracy and performance. 9. System availability. 10. System auditability. 11. Alerts and alarms.
	During each OAT, the TISC shall automate and conduct all user interface performance requirement testing with virtual users.
	Upon SRTA-approval of each OAT, the TISC shall update all Project related drawings and documentation to reflect the delivered system design and configuration.

#### 4.8.6 Entry/Exit Criteria

Progressing through the ETCS System Testing will be managed through a set of entry and exit criteria for every test phase and Go Live milestone of the required ETCS System Testing program. The entry/exit criteria for the ETCS System Testing are shown in the following Table 15: Test Entry / Exit Criteria.

**Table 15: Test Entry / Exit Criteria**

TEST ENTRY/ EXIT CRITERIA BY TEST PHASE	
FAT	
Entry Criteria	Exit Criteria
1. User Access Level Matrix submitted to SRTA for approval. 2. Approved FAT Test Plan and Procedures. 3. TISC has submitted test results of successful FAT pre-tests to SRTA for review. 4. Day-by-day schedule of the planned tests by test case. 5. Approved FAT test sites. 6. FAT Test TRR conducted and approved. 7. All system components and functionality for this test are in place, available and ready to be tested.	1. All expected FAT tests run and passed with no outstanding S1 or S2 failures. 2. SRTA or SRTA designees witnessed all FAT tests. 3. FAT Test Report delivered and approved by SRTA. 4. Agreement between the TISC and SRTA for Severity Levels assigned to any issues, discrepancies, and failures. 5. TISC resolution plan for addressing S3 and S4 items has been accepted by SRTA.



8. TFH cloud-based environment configured to match fully deployed environment.	
<b>NETWORK CONNECTIVITY TEST</b>	
<b>Entry Criteria</b>	<b>Exit Criteria</b>
<ol style="list-style-type: none"> <li>1. Approved Network Connectivity Test Plan and Test Procedures.</li> <li>2. Day-by-day schedule of the planned tests by test case.</li> <li>3. Network Connectivity TRR conducted and approved.</li> </ol>	<ol style="list-style-type: none"> <li>1. All Network Connectivity tests run and passed with no outstanding S1 or S2 failures.</li> <li>2. SRTA or SRTA designees witnessed all Network Connectivity tests.</li> <li>3. Network Connectivity Test Report delivered and approved by SRTA.</li> <li>4. TISC resolution plan for addressing S3 and S4 items has been accepted by SRTA.</li> </ol>
<b>REVENUE READY TEST</b>	
<b>Entry Criteria</b>	<b>Exit Criteria</b>
<ol style="list-style-type: none"> <li>1. Approved FAT (Roadside and TFH).</li> <li>2. Approved Network Connectivity Test.</li> <li>3. Approved Test Plans and Procedures for measuring TFH Transition Level SLAs.</li> <li>4. Approved TFH RRT Plan and Procedures.</li> <li>5. All TRDMS and TR CCTV in the Facility Pair transitioned to the TISC network and configured for operations.</li> <li>6. All Severity Level 1 and Severity Level 2 issues from prior tests resolved.</li> <li>7. TFH installed and configured in the Cloud production environment in accordance with the approved TFH installation checklist.</li> <li>8. MOMS configured to monitor the TFH, TRDMS, TRCCTV, and TISC network.</li> <li>9. TISC image review approach is operational.</li> <li>10. The training environment is functioning, verified, and stable.</li> <li>11. Required training courses conducted at least 30 days prior to TFH RRT.</li> <li>12. Conduct and approval of TFH RRT pre-test.</li> <li>13. TFH RRT TRR conducted and approved.</li> </ol>	<ol style="list-style-type: none"> <li>1. All TFH RRT tests run and passed with no outstanding S1 or S2 failures.</li> <li>2. SRTA or SRTA designees witnessed the TFH RRT.</li> <li>3. Successful completion of the post RRT 7-day burn.</li> <li>4. TFH RRT Report delivered and approved by SRTA.</li> <li>5. TISC resolution plan for addressing S3 and S4 items has been accepted by SRTA.</li> </ol>

FSIT	
Entry Criteria	Exit Criteria
<ol style="list-style-type: none"> <li>1. SRTA approval of TFH Go Live.</li> <li>2. Approved First Site Integration Test Plan and Test Procedures.</li> <li>3. Approved Test Plans and Procedures for measuring Roadside Transition Level SLAs.</li> <li>4. Approved Site Installation Checklist (SIC).</li> <li>5. Test personnel briefed on required Safety Procedures.</li> <li>6. Installation of the first site on the facility approved in accordance with the SIC.</li> <li>7. 6. MOMS configured to monitor all toll point, ITS, and network equipment tested at the FSIT.</li> </ol>	<ol style="list-style-type: none"> <li>1. All FSIT tests run and passed with no outstanding S1 or S2 failures.</li> <li>2. SRTA or SRTA designees witnessed the FSIT.</li> <li>3. FSIT Report Delivered and approved by SRTA.</li> <li>4. 4. TISC resolution plan for addressing S3 and S4 items has been accepted by SRTA.</li> </ol>
SCT	
Entry Criteria	Exit Criteria
<ol style="list-style-type: none"> <li>1. SRTA approval of the FSIT for the facility.</li> <li>2. Test personnel briefed on required Safety Procedures.</li> <li>3. Approval of any required updates to the FSIT Test Plan and Procedures.</li> <li>4. Installation of the SCT site approved in accordance with the SIC.</li> <li>5. MOMS configured to monitor all toll point, ITS, and network equipment tested at the SCT.</li> </ol>	<ol style="list-style-type: none"> <li>1. All SCT tests run and passed with no outstanding S1 or S2 failures.</li> <li>2. SRTA or SRTA designees witnessed the SCT.</li> <li>3. SRTA approval of the SCT for the tested site</li> <li>4. For the last SCT on a Facility, SRTA approval of the SCT Test Report.</li> <li>5. TISC resolution plan for addressing S3 and S4 items has been accepted by SRTA.</li> </ol>
OAT	
Entry Criteria	Exit Criteria
<ol style="list-style-type: none"> <li>1. Approved Operational Acceptance Test (OAT) Plan and required reports and/or verification methods.</li> <li>2. Approved FSIT and SCTs for all facilities within the facility pair.</li> <li>3. All Severity Level 1 and Severity Level 2 issues from prior tests resolved.</li> </ol>	<ol style="list-style-type: none"> <li>1. OAT run for 30 consecutive days with no Severity Level 1 and 2 issues or faults.</li> <li>2. SRTA or SRTA designees granted access to all OAT artifacts and data.</li> <li>3. OAT results verified by SRTA or SRTA designates.</li> <li>4. OAT Report Delivered and approved by SRTA.</li> </ol>

4. Approved MMR reports, calculations, format, and supplemental data for measurement of TFH and Roadside Maintenance Level SLAs. 5. Written notification of the proposed OAT start date. 6. OAT TRR conducted and approved.	
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The requirements associated with entry and exit criteria are as follows:

No.	Requirement
	The TISC shall submit for SRTA review, comment, and approval an Entry/Exit status report format for all formal test phases for the ETCS Project(s).
	The TISC shall maintain the SRTA-approved Entry/Exit status report to provide details on all criteria demonstrating which have been met and which are still outstanding.
	For each toll facility, for each formal test, and for each entry/exit criteria, the TISC shall track and report on a weekly basis the detailed list of tasks required to meet all criteria.
	Unless otherwise permitted by SRTA, the TISC shall satisfy every entry and/or exit criteria of a formal test and receive SRTA approval of the Formal Test Report before requesting SRTA approval to proceed to the next approved step of the Project.

#### 4.8.7 Test Reports and Artifacts

Test reports and artifacts will serve as an important communication method between the TISC and SRTA while system testing is being conducted. SRTA will review data sets and reports throughout system testing to validate data and system performance.

No.	Requirement
	SRTA shall have access to all data sets and reports used by the TISC to demonstrate compliance with the tested requirements and/or SLAs for all informal and formal tests conducted.
	<b>Formal Test Report</b>
	Within ten (10) business days following the completion of the formal test for each FAT, TFH Revenue Ready Test, Network Connectivity Test, FSIT, the last SCT in a Facility Pair, and the OAT for each Facility Pair, the TISC shall submit a Formal Test Report for review and approval by SRTA.
	The Formal Test Report shall describe: <ol style="list-style-type: none"> <li>1. Test artifacts.</li> <li>2. Test results.</li> <li>3. Witness sign-off.</li> <li>4. All issues/defects found.</li> <li>5. Severity level of each issue/defect.</li> </ol>

No.	Requirement
	6. Status of each issue/defect. 7. Plans for resolution, including projected resolution date. 8. Recommendation for retests (if appropriate). 9. Notes and Comments.
	Test Case Report
	During FAT, TFH Revenue Ready Test, Network Connectivity Test, FSIT, and OAT, the TISC shall conduct a daily debrief and submit daily Test Case Reports.
	Daily Test Case reports shall contain the following: <ol style="list-style-type: none"> <li>1. Total test cases run.</li> <li>2. Total test cases closed (% complete).</li> <li>3. Total defects opened.</li> <li>4. Total defects closed.</li> <li>5. Remaining open defects by Severity Level.</li> <li>6. Total test cases exercised this reporting period (by resource name).</li> <li>7. Total test cases closed this reporting period.</li> <li>8. Total defects opened this reporting period.</li> <li>9. Total defects closed this reporting period.</li> <li>10. Notes and Comments.</li> </ol>

#### 4.8.8 Image Processing System Configuration and Operations

Image Processing System (IPS) tuning is required to configure and establish IPS operations as part of the test program.

Following are requirements for IPS tuning:

No.	Requirement
	The TISC shall configure their Image Processing System (IPS) for inclusion in the functional testing of the Revenue Ready Test (RRT).
	The overall performance of the IPS as measured by its assigned SLAs shall be measured at the OAT.
	Image truth data and test sets collected by the TISC to be used in the OAT to verify IPS SLAs shall be a minimum of 100,000 images each unless otherwise approved by SRTA.
	Image truth data and test sets collected by the TISC to be used in the OAT to verify IPS SLAs shall be subject to SRTA review and approval.
	Image truth data and test sets collected by the TISC to be used in the OAT to verify IPS SLAs shall contain all types of images (human readable and non-readable) captured from cameras deployed for the toll facilities.
	Image truth data and test sets to be used in the OAT to verify IPS SLAs shall be representative sample images of all types of plates from SRTA roadways such as various times of day and

No.	Requirement
	night, weather conditions, traffic conditions, representative Georgia and out of state plates, and locations.

#### 4.8.9 Partial System Acceptance and Final System Acceptance

For each toll facility pair, SRTA will grant Partial System Acceptance upon the successful completion and SRTA approval of the OAT and OAT Report, validations by SRTA of closure of all punch-list items, completion and submission of all required documents including as-builts and updates to manuals to SRTA's satisfaction, and satisfaction of all OAT exit criteria conditions as specified in this RFP and the Contract Documents. SRTA will grant Final System Acceptance after both facility pairs have been granted Partial System Acceptance.

After Partial System Acceptance for each toll facility pair, system testing shall be managed as part of the TISC's Maintenance Management Plan.

### 4.9 Training Plan and Program

#### 4.9.1 General Training Requirements

The TISC will provide comprehensive training for all aspects of the ETCS, including operations, system monitoring, problem detection and resolution, reconciliation and audit, and maintenance of the ETCS. The training program will be structured to support SRTA's plan to operate the toll collection system. As such, SRTA staff must be fully trained to successfully perform and understand all aspects of the toll collection operations even for those operational areas the TISC will be responsible for (i.e., image review and maintenance). Training will be delivered to SRTA's personnel and SRTA's designees. The number of SRTA-designated personnel to be trained per class is addressed in the specific course description sections below. SRTA may require additional courses be offered or additional personnel be provided training. The TISC shall accommodate these requests to the extent possible with onsite personnel and Documentation that is readily available. The TISC may allow their personnel to attend training sessions with SRTA's written permission and if there is room in the session.

Training shall be provided utilizing the Training Environment defined and described in Section 2.2.4.5: Additional TFH System Instances.

SRTA will provide the training facility and student workstations or laptops. The general requirements of the Training Plan and Program are as follows:

No.	Requirement
	The TISC shall provide a comprehensive training program designed to educate SRTA personnel and SRTA-designees in the operation and use of the ETCS.
	Training shall be conducted by experienced trainers with at least three (3) years of experience developing a training curriculum and conducting training for electronic tolling systems.
	The Trainers shall have proven communication skills, be fluent in English, and be an SME on the subject they are providing training.

No.	Requirement
	As much as practical and useful, training shall be hands on and use actual deliverable Hardware and Software in the training environment.
	The TISC shall make reservations for any use of SRTA training rooms at least two (2) months in advance.
	The TISC shall conduct training sessions between the hours of 9:00 a.m. to 3:00 p.m. Monday through Friday.
	For any instructions requiring hands on student activity, classes shall be structured based on the assumption that students will each have their own workstation to be able to interact directly with the training environment.
	The TISC shall provide all required training equipment, software, and materials not explicitly provided by SRTA.
	<p>The TISC shall deliver and maintain all required training materials to include:</p> <ol style="list-style-type: none"> <li>1. Instructor guides.</li> <li>2. Student workbooks.</li> <li>3. Self-guided tutorials or videos for independent study and review.</li> <li>4. Visual aids.</li> <li>5. Technical manuals.</li> <li>6. Diagrams.</li> <li>7. PowerPoint presentations.</li> <li>8. Handouts.</li> <li>9. Test and other evaluation materials.</li> <li>10. Course Completion Certificates.</li> </ol>
	The TISC shall provide updates to training materials based on discrepancies, errors, or omissions discovered during live training sessions.
	The TISC shall update after TFH Go Live, after every completed Change Order and at a minimum annually, all training course content, training materials and documentation.
	On an annual basis, the TISC shall purge from the training curriculum all training content that is no longer relevant and make updates to all training material as needed (e.g., updates to system).
	TISC shall receive SRTA approval of all changes or purging of training content prior to changes being made to training material.

#### 4.9.2 Training Plan

The TISC is required to document, in detail, the proposed plan for comprehensive training of SRTA and SRTA-designated personnel on the operation and use of the ETCS.

The requirements for the Training Plan are as follows:

No.	Requirement
	TISC shall develop and deliver a Training Plan for SRTA's review, comment, and approval no less than 90 days before the start of the first planned training class.
	The TISC shall conduct a Training Plan workshop to review the training requirements and the training schedule; discuss planned course content details, training methods (e.g., lectures with hands on work, train the trainer, video recording, self-directed), intended audience for each course; and collect additional details for the development of the Training Plan and training conduct.
	The Training Plan shall include a sample training course with all associated (sample) materials.
	The Training Plan shall identify how and when the TISC will train users on all components of the ETCS to include all custom and COTS software and all hardware and equipment.
	The Training Plan shall identify the trainer and supporting SME for each course.
	<p>The Training Plan shall provide the following information for each training course:</p> <ol style="list-style-type: none"> <li>1. The purpose of the course.</li> <li>2. The qualification requirements for the trainer(s) and any planned SMEs.</li> <li>3. The intended audience as defined by user roles approved by SRTA.</li> <li>4. Course content outline/summary.</li> <li>5. Estimated training course duration.</li> <li>6. Training materials to be provided.</li> <li>7. All equipment required for training conduct.</li> <li>8. Data preparation, such as user role specific accounts, test Transactions, images, and Trips.</li> <li>9. Any logistical requirements, i.e. if the training is to be conducted in a classroom or roadside.</li> <li>10. Any IT requirements including network and system access, training accounts, and security briefings.</li> <li>11. Course evaluation methodology to 1) measure the trainee's mastery of the content, 2) capture the trainees' evaluation of the trainer and the course including the provision to save and report these results.</li> <li>12. A Certificate of Completion for all trainees as documented proof of receiving and completing the training.</li> </ol>
	The Training Plan shall include how all training materials will be generated and maintained electronically throughout the term of the Contract.
	The TISC shall detail in the Training Plan how the training environment will be used and maintained, including any security or safety issues.
	The TISC shall detail in the Training Plan the management and planning for resources required to conduct screen and data updates and create controlled data sets for scheduled training sessions.
	The Training Plan shall describe how the TISC training staff will coordinate with the TISC's documentation and requirements traceability resources to ensure all training content is maintained and updated to reflect changes in the ETCS in a timely fashion.

No.	Requirement
	The TISC shall receive SRTA approval on the Training Plan prior to developing the individual training courses.

#### 4.9.3 Training Program Delivery Schedule

SRTA requires training for each toll facility to be conducted early in the project to ensure that SRTA and their authorized representatives are adequately prepared to evaluate system functionality prior to TFH Revenue Ready Testing, roadside First Site Integration Testing, and Operational Acceptance Testing. The Training Program Delivery Schedule will be a component of the Master Project Schedule. For the initial submission of the Master Project Schedule, the TISC can include the duration of time anticipated to meet the requirements of this RFP. After the Training Plan Workshop is completed, the TISC will be required to update the Master Project Schedule with the detailed training tasks and deadlines.

The requirements for the Training Program Delivery Schedule are as follows:

No.	Requirement
	The TISC shall develop a training schedule (as part of the Master Project Schedule) that identifies the planned test dates, the delivery of the training plan, and the delivery of the full set of training materials for each course including instructor guides, student workbooks, and all training course content for SRTA's review, comment, and approval.
	The TISC shall receive SRTA's approval of the Training Program Delivery Schedule prior to scheduling any training classes.

#### 4.9.4 Training Courses

The following Table 16: Training Courses summarizes the types of training courses required and the number of classes to be taught, the roles of the projected trainees, the maximum number of trainees per class, and the minimum duration of instruction to be provided per training class.

**Table 16: Training Courses**

Course Name	Projected Trainees	# of Classes Per Course	Max # of Trainees	Minimum Duration
High Level System Overview	SRTA Managers, Marketing, SRTA IT, public information	2	20	4 hours
System Operations	SRTA Engineering, IT, and operations personnel	3	20	8 hours
Image Processing, Review and Audit	SRTA Image Auditors and Image Audit Managers	3	15	4 hours
Congestion Pricing	SRTA Engineering	3	10	4 hours

The requirements for the Training Courses are the following:



No.	Requirement
	With SRTA approval of the Training Plan, the TISC shall submit specific training course content and materials to SRTA for review, comments, and approval.
	The TISC shall design training courses and materials to support current and future training needs as determined at the Training Plan Workshop.
	The TISC shall provide, at a minimum, the following training courses for SRTA's review, comments, and approval: <ol style="list-style-type: none"> <li>1. High Level System Overview.</li> <li>2. System Operations.</li> <li>3. Image Processing, Review, and Audit.</li> <li>4. Congestion Pricing.</li> </ol>
	The TISC shall customize each training course to meet the needs of the intended audience.
	Each set of course material shall be submitted to SRTA for review and approval no later than 60 days before the date of the first planned class for that course.
	With SRTA approval of a training course, the TISC shall maintain a reproducible set of documentation electronically in searchable PDF format in SRTA's Project Management Platform.
	All training courses shall be recorded by the TISC and distributed properly to eligible SRTA personnel.
	The TISC shall include each training course as an addendum in the Training Plan.
	Upon SRTA request, the TISC shall prepare for each training course and provide SRTA with a self-guided interactive tutorial containing all core information of the training course including a trainee validation questionnaire.
	In case self-guided interactive tutorials are produced, they shall be maintained and updated by the TISC so that SRTA can use them at any time through the Term of the Contract.

#### 4.9.4.1 High-Level System Overview

This overview course is designed primarily for SRTA managers, public information and marketing staff, Information Technology (IT) personnel, and others who require a basic understanding of the entire Electronic Toll Collection System.

No.	Requirement
	The TISC shall provide a High-Level System Overview training course as an interactive training session providing all trainees hands-on access to the system.
	The TISC shall offer the course three (3) times during the Project: once no later than thirty (30) days before each Revenue Ready Test (RRT) and once after Final Acceptance.
	The High-Level System Overview course shall be required to support training of a maximum of twenty (20) attendees per class with a duration of at least four (4) hours per class.
	The TISC shall design the course to provide information on: <ol style="list-style-type: none"> <li>1. Overview of the end-to-end workings of the Electronic Toll Collection System from transaction/image creation/capture through trip posting to the CBO.</li> <li>2. Overview of the roadside physical infrastructure.</li> </ol>

No.	Requirement
	<ol style="list-style-type: none"> <li>3. TFH: <ol style="list-style-type: none"> <li>a. Operations.</li> <li>b. Dashboards.</li> <li>c. User Interfaces.</li> <li>d. Trip Building.</li> <li>e. Congestion Pricing.</li> </ol> </li> <li>4. CCTV Camera Subsystem (DVAS use and operations).</li> <li>5. Toll Rate DMS Subsystem (Signs, rates, and cameras).</li> <li>6. Travel Time Subsystem (calculations and usage). <ol style="list-style-type: none"> <li>a. GPLS AVI System</li> <li>b. Traffic sensor</li> </ol> </li> <li>7. Image Processing, Review, and Audit.</li> <li>8. Reconciliation, Audit, and Reports.</li> <li>9. System Maintenance and reporting problems.</li> <li>10. Security.</li> </ol>
	High-Level System Overview training shall be attended by SRTA Managers, Public Information staff, Marketing, and SRTA IT personnel. Training materials for this course may also be used as part of public information campaigns. Other SRTA staff may also attend these class sessions.

#### 4.9.4.2 System Operations

This course is targeted at SRTA IT staff and operations personnel and provides an in-depth knowledge of the operations, administration and maintenance of the system. While the content of this course is much like the System Overview course above, it is expected the System Operations course will cover each of these topics in greater detail.

No.	Requirement
	The TISC shall provide a comprehensive System Operations training course as an interactive training session providing all trainees hands-on access to the system.
	The TISC shall provide a glossary of all relevant terms used in the training.
	The TISC shall conduct the System Operations course three (3) times: once no later than thirty (30) days prior to start of each TFH Revenue Ready Test and one (1) class held at a date to be determined with SRTA during the Training Plan Workshop.
	The System Operations course shall be required to support training of a maximum of twenty (20) attendees per class with a duration of at least eight (8) hours per class.
	<p>The TISC shall design the course to provide information on:</p> <ol style="list-style-type: none"> <li>1. Electronic Toll Collection components, functions, and operations.</li> <li>2. System security and administration.</li> <li>3. TFH System, Operations, Dashboards, Reports, and Interfaces: <ol style="list-style-type: none"> <li>a. Trip Building.</li> <li>b. Congestion Pricing.</li> </ol> </li> </ol>

No.	Requirement
	<ul style="list-style-type: none"> <li>c. Audit and Reconciliation.</li> <li>d. Including a step-by-step process on how to audit transactions, from initial receipt of transaction to reconciliation of the transaction.</li> <li>e. Including a list of all reports as well as a reports matrix that will be used to reconcile transactions cradle to grave. This includes all system generated reports descriptions and purpose.</li> <li>f. GUI search functions.</li> <li>g. Reporting system and how to create ad hoc reports.</li> <li>h. MOMS, maintenance activities, and problem reporting.</li> <li>i. Image Processing, Review, and Audit: <ul style="list-style-type: none"> <li>i. User interface training.</li> <li>ii. Detailed transaction processing and workflows.</li> <li>iii. Reports.</li> </ul> </li> </ul> <ul style="list-style-type: none"> <li>4. CCTV Camera subsystem (DVAS).</li> <li>5. Toll Rate DMS subsystem (signs, rates, and cameras).</li> <li>6. Travel Time subsystem calculations and usage.</li> <li>7. GPLS AVI System.</li> <li>8. Traffic sensors.</li> <li>9. Details of system security.</li> </ul>
	System Operations training shall be attended by SRTA Engineering, IT, and Operations staff. Other SRTA staff may also attend these class sessions.
	Participants shall be trained on scenarios which realistically represent normal day-to-day operations as well as likely problem scenarios.
	Real traffic data and images shall be setup in the training database to create real-life examples to reinforce the training activity.

#### 4.9.4.3 Image Processing, Review and Audit

This course is targeted for SRTA Image Auditors and Image Audit Managers on how to use the audit system. This course will include a basic understanding of how the IPS itself functions and TISC's IPS operations as a basis for understanding how to best use the audit system.

No.	Requirement
	The TISC shall provide a comprehensive Image Processing, Review and Audit training course as an interactive training session providing all trainees hands-on access to the system.
	The TISC shall conduct the Image Audit System course three (3) times: once no later than thirty (30) days prior to start of each TFH Revenue Ready Test and one (1) class held at a date to be determined with SRTA during the Training Plan Workshop.
	The Image Processing, Review, and Audit course shall be required to support training of a maximum of fifteen (15) attendees per class with a duration of at least four (4) hours per class.
	The TISC shall design the course to include the following:

No.	Requirement
	<ol style="list-style-type: none"> <li>1. User Interface screens and operations capability demonstrating the user-friendly, efficient processes for reviewing images and confirming license plate reads.</li> <li>2. Roadside audit process that allows users to verify image to vehicle correlation.</li> <li>3. Tracking the performance and production of the system.</li> <li>4. Image time horizon and workflows.</li> <li>5. Discussion of the Quality Assurance functions including performance measurement and detail reporting.</li> <li>6. Compilation of operational statistics for Key Performance Indicators (KPIs) (to be defined in detail during design process).</li> <li>7. Production of image quality reports showing acceptance levels and rejects by reason.</li> <li>8. Image Review Dashboards.</li> </ol>
	Image Processing, Review, and Audit training shall be attended by SRTA Image Auditors and Image Audit Managers. Other SRTA staff may also attend these class sessions.
	Participants shall be trained on scenarios which realistically represent normal day-to-day image audit operations as well as likely problem scenarios.
	Real traffic data and images shall be setup in the training database to create real-life image review and audit examples to reinforce the training activity.

#### 4.9.4.4 Congestion Pricing

This course is intended to train SRTA Engineering staff on the use of the Congestion Pricing System (CPS). This course will include an in depth understanding of how the CPS functions, including concepts like Pricing Intervals and Pricing Segments, configuring and scheduling a rate plan, and testing new rate plans.

No.	Requirement
	The TISC shall provide a comprehensive CPS training course as an interactive training session providing all trainees hands-on access to the system.
	The TISC shall conduct the CPS course three (3) times: once no later than thirty (30) days prior to start of each TFH Revenue Ready Test and one (1) class held at a date to be determined with SRTA during the Training Plan Workshop.
	The CPS course shall be required to support training of a maximum of ten (10) attendees per class with a duration of at least four (4) hours per class.
	<p>The TISC shall design the course to include the following:</p> <ol style="list-style-type: none"> <li>1. User Interface screens and operations capability demonstrating the user-friendly, efficient processes for configuring, testing, and scheduling rate plans.</li> <li>2. DPS Dashboards and reports.</li> <li>3. Pricing concepts including pricing segments, pricing intervals and traffic congestion measures.</li> <li>4. Pricing timelines.</li> <li>5. Interaction with rate signs and cameras.</li> </ol>
	CPS training shall be attended by SRTA Engineering staff. Other SRTA staff may also attend these class sessions.

No.	Requirement
	Participants shall be trained on scenarios which realistically represent normal day-to-day CPS operations as well as likely problem scenarios.
	Real traffic shall be setup in the training database for use in the class to create real-life pricing scenarios to reinforce the training activity.

## 5 Operation and Maintenance

Operation and maintenance activities in this Project are different in their nature and TISC scope and responsibilities are described separately in this section. SRTA expects though that both operation and maintenance activities shall be managed in the higher level by one Operation and Maintenance Manager, who shall become the main point of contact for SRTA during the Operation and Maintenance Phase, replacing the Project Manager, who shall become a supporting role, when and if needed, after Final System Acceptance.

### 5.1 Standard Operating Procedures

To facilitate and streamline operations, system troubleshooting, and system maintenance, SRTA and GDOT have developed Standard Operating Procedures (SOPs) that are to be adhered to by all project team members including the TISC. These SOPs include external SOPs (those where 3<sup>rd</sup> parties other than SRTA and the TISC must be involved for work completion), and internal SOPs (those relevant to SRTA and the TISC only that do not require outside involvement for work completion). SOPs are living documents that evolve based on input from SRTA, GDOT, Toll System Integrators, GDOT Contractors, and other 3<sup>rd</sup> parties contributing to SRTA and GDOT projects. Review of existing SOPs as well as discussion regarding potential new SOPs are discussed on a regular basis at the SRTA Project Management meetings and the GDOT maintenance meetings.

The list of current SOPs is documented in Table 17: Standard Operating Procedures below. The Procedures can be found in Attachment 4: Standard Operating Procedures.

**Table 17: Standard Operating Procedures**

#	SOP Name	Description
1.	SRTA Frozen Peach Pass Webpage (INTERNAL)	SRTA webpage posts toll rates from various signs along each corridor. This SOP defines how to resolve issues with the Toll rates not updating, blank or webpage not available.
2.	SRTA/GDOT Fiber Break (EXTERNAL)	Defines GDOT/SRTA demarcation points and responsibility to investigate and repair broken fiber.
3.	SRTA/GDOT Structure Damage (EXTERNAL)	Defines the proper reporting of any structure damage to both SRTA and GDOT entities.
4.	Foliage SOP (EXTERNAL)	Defines the communication and course of action to resolve foliage obstructions along toll facilities.
5.	GDOT/SRTA Electrical Infrastructure	Identifies GDOT/SRTA demarcation for areas of responsibilities with utility power outages and communication methods to resolve.

#	SOP Name	Description
	(EXTERNAL)	
6.	GDOT/SRTA HUB HVAC (EXTERNAL)	Identifies communication methods to get HVAC issues resolved at GDOT HUB Buildings.
7.	75 South TSI Critical Maintenance Guidelines (EXTERNAL)	Guidelines for when TSI requires access due to a critical toll system failure and cannot wait for the next scheduled maintenance window.
8.	NWC TSI Critical Maintenance Guidelines (EXTERNAL)	Guidelines for when TSI requires access due to a critical toll system failure and cannot wait for the next scheduled maintenance window.

The requirements for SOPs are as follows:

No.	Requirement
	The TISC shall adhere to all Standard Operating Procedures as defined in Attachment 4: Standard Operating Procedures (SOPs) in all applicable phases on the ETCS Project and for the Term of the Contract.
	The TISC shall incorporate all modified and new applicable SOPs into the TISC management plans and other applicable contract deliverables.
	Throughout the term of the TISC Contract, the TISC shall work with SRTA and GDOT to incorporate and adhere to any SOPs that are modified or newly developed after contract award.

## 5.2 Operational Services

### 5.2.1 Early Operational Support (EOS)

Whereas the Operation and Maintenance Phase shall start after the Final System Acceptance, Early Operational Support (EOS) services shall be provided by the TISC prior to Final System Acceptance during the Transition Phase. Right after successful TFH RRT of each Facility Pair, the TISC shall provide image review services to SRTA. These services shall continue to be provided until Final System Acceptance is awarded by SRTA. **Figure 16: Operations Services** shows the TISC's operation obligations as they evolve during the Term of the Contract.

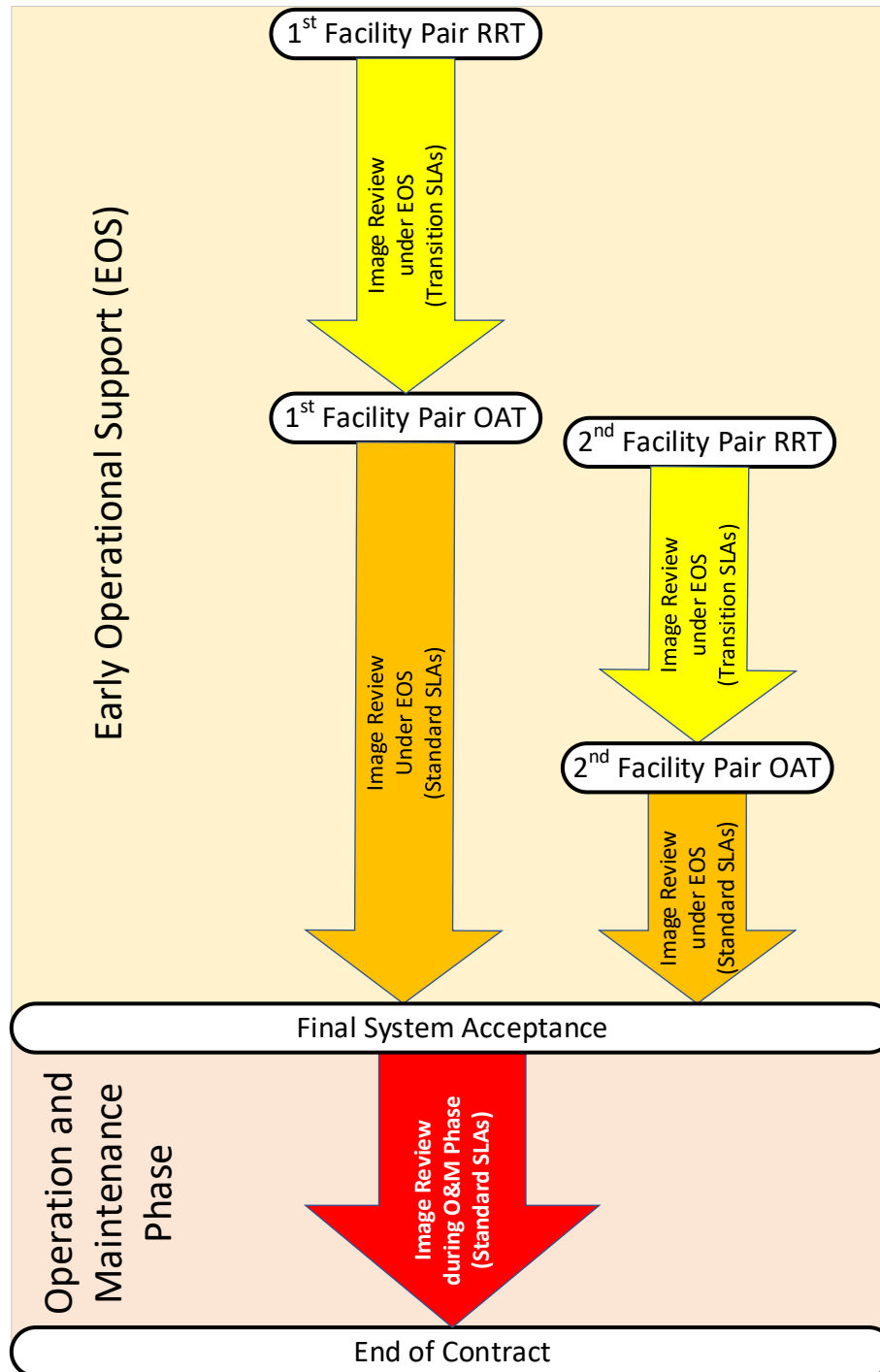


Figure 16: Operations Services

### 5.2.2 Operations Concept

The TISC shall develop a concept on how to address and execute all necessary Operation activities necessary to fulfill the requirements of this RFP and the Contract.

### 5.2.3 Operations Resources

The TISC shall maintain at all times enough staff to comply with the Operations performance requirements as specified in Appendix E: Service Level Agreements and elsewhere in this RFP, always covering demand during seasonal peak periods as well as during planned and unplanned events.

Below are the requirements for Operations Resources:

No.	Requirement
	Operation shall be managed by the Operations and Maintenance Manager supported by the TFH Operations Liaison. Both shall be fully dedicated to the Project during the entire Operation and Maintenance Phase.
	The TISC shall keep accurate training records on all operations personnel, so that evidence of completion of such training shall be provided to SRTA upon request.
	SRTA shall be permitted to audit operation personnel qualifications and training records at any time.

### 5.2.4 Image Review Process

The TISC, supported by their Image Processing System (IPS), will accurately and promptly identify the license plate information on every vehicle traveling through SRTA's Express Lane Facilities.

Currently, SRTA works with the Georgia Department of Corrections (GDC) for staff to conduct the manual image reviews for SRTA's existing toll facilities. The program is a success and is beneficial to all parties involved. SRTA encourages all bidders to work with the GDC for staffing to perform manual image reviews.

Following are general Image Review Process requirements:

No.	Requirement
	The TISC shall be responsible for creating and processing Transaction images, including accurate assignment of a license plate result or code-off code for all Transactions on all SRTA ETCS facilities.
	The image review results shall fulfill related SLA requirements as defined in Appendix E: SLAs, to support SRTA Operations (e.g., violation lookups, customer service calls, equipment degradation verifications).
	The TISC shall be responsible for all image processing to provide identification of a license plate result, which includes the license plate number (LPN), license plate jurisdiction (LPJ), and license plate type (LPT), for all Transactions on all SRTA ETCS facilities.
	The TISC shall accurately process image transactions. Errors in identified images can result in the incorrect customer being billed and/or the customer being billed at the incorrect rate; such errors impact customer service and public perception.
	All manual image review labor services shall only be performed in the continental United States of America.
	The TISC shall have a manual process to assign a code-off code when a license plate result cannot be ascertained for a transaction.



No.	Requirement
	All code-off codes shall be agreed upon with SRTA during the Design Phase.
	The method of assigning a code-off code when multiple reasons for failure are present in any image shall be agreed upon with SRTA to ensure system-caused and vehicle-caused errors are consistently monitored and reported.
	<p>The TISC shall be responsible for ensuring that at least the following data elements are provided for each transaction:</p> <ol style="list-style-type: none"> <li>1. License Plate Number (LPN).</li> <li>2. License Plate Jurisdiction (LPJ).</li> <li>3. License Plate Type (LPT).</li> <li>4. Code-off codes (if applicable).</li> </ol>

### 5.3 Operational Management and Coordination

The TISC shall be required to work with or associate with other vendors or providers in order to provide a fully integrated and operational system. The TISC shall cooperate to their fullest extent with any other vendor or provider in order to ensure that the ETCS does not conflict or cause any deterrent in capability or service to the traveling public, GDOT or SRTA.

The TISC shall organize and facilitate monthly Operation Coordination meetings with SRTA.

Below are the requirements for the monthly Operation Coordination meetings:

No.	Requirement
	The monthly Operation Coordination meetings shall be held in person at SRTA premises.
	The TISC Operation and Maintenance Manager and the TFH Operations Liaison shall participate in the meetings.
	SRTA reserves the right to invite to the meetings representatives of the CBO provider and other stakeholders involved in SRTA's tolling operations.
	The monthly Operation Coordination meetings may be combined with the monthly Maintenance Coordination meetings upon TISC request and SRTA approval.

#### 5.3.1 Operation Plan

The TISC shall develop and submit to SRTA an Operation Plan for the Project. The Operation Plan will serve as the basis for all operation services to be provided by the TISC during the term of the Contract.

No.	Requirement
	The TISC shall submit an Operation Plan no less than 120 days prior to the beginning of the RRT for the first Facility Pair.
	The Operation Plan shall include a description of the operation methodology and approach.
	The Operation Plan shall include the following for staffing:

No.	Requirement
	<ol style="list-style-type: none"> <li>1. Organization Chart.</li> <li>2. Staffing assignments and schedule.</li> <li>3. Qualifications of all assigned staff.</li> <li>4. For all staff, the % time they are local to Atlanta, GA and the % time they are remote.</li> <li>5. For all staff, the % time they are dedicated to the Project by facility.</li> <li>6. Description of the staff training approach and plan.</li> <li>7. Description of the staff replacement approach and plan.</li> <li>8. Email and phone contact details for all assigned staff.</li> </ol>
	<p>The Operation Plan shall describe all SRTA-approved TISC operation subcontractor agreements or arrangements to include:</p> <ol style="list-style-type: none"> <li>5. Entity contracted.</li> <li>6. Scope of work.</li> <li>7. Description of qualifications or licensing.</li> <li>8. Term of the Contract.</li> </ol>
	The Operation Plan shall include an Operation Schedule that contains key activities.
	The Operation Plan shall include an Operation Communication Plan.

#### 5.3.1.1 Operation Communication Plan

With the purpose to facilitate clear and efficient communication between stakeholders, the TISC shall maintain within the Operation Plan an Operation Communication Plan, which shall be an evolution of the respective plan included in the PMP, focusing on operational matters. Communication procedures with at least the following stakeholders shall be considered in the Operation Communication Plan:

- 1) SRTA.
- 2) GDOT.
- 3) Commercial Backoffice provider.
- 4) Georgia Tech.
- 5) PeachPass website administration.

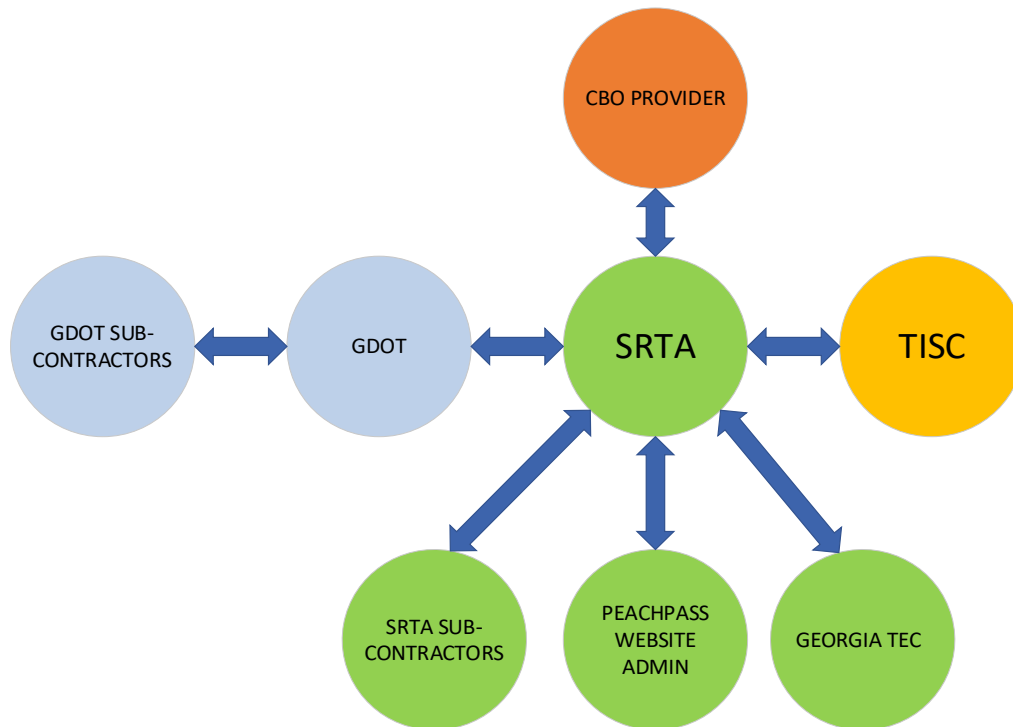


Figure 17: Operations Communication Diagram

### 5.3.2 Operation Plan Updates

The Operation Plan (including the Operation Communication Plan) shall be updated by the TISC on an annual basis or ad hoc upon SRTA request, every time major changes in the operation concept, policies or procedures are implemented.

Below are the requirements for updating the Operation Plan:

No.	Requirement
	The update shall occur on an annual basis or more frequently if there are changes in applicable policies and procedures.
	The TISC may request approval from SRTA not to update the Operation Plan if it determines during its annual review of the Operation Plan that no changes are necessary.
	All updates or changes to the Operation Plan shall be submitted for review and acceptance by SRTA prior to incorporating the proposed changes or updates.
	No actions shall be taken by the TISC regarding any proposed changes and/or updates to the Operation Plan without prior written acceptance by SRTA.
	All proposed changes and updates must be directed to the most current version of the Operation Plan.

## 5.4 Operational Reporting

The TISC shall provide weekly and monthly operation reports that shall allow for effective management of the entire image review process, both manual and automated, supporting SRTA operations and documenting performed scope and compliance to performance requirements as described in Appendix E: Service Level Agreements.

### 5.4.1 Weekly Operation Report

The TISC shall provide weekly a report documenting the Image Review activity for the preceding week.

Below are the requirements for the weekly operation report:

No.	Requirement
	The Weekly Operation Report shall provide all information necessary to allow SRTA to review and audit TISC-rejected images (up to 50 per page) that shall be sent daily to SRTA in PDF format. The report shall include relevant information about each rejected image-based transaction, including location, date/time, image reviewer, reject reason, and any available OCR/ALPR information.
	The Weekly Operation Report shall provide all information necessary that allows SRTA to access the results of the review, including but not limited to: <ol style="list-style-type: none"><li>1. TISC/vendor.</li><li>2. Number of transactions transmitted.</li><li>3. Number of images accepted.</li><li>4. Images rejected.</li><li>5. Quantity by reject reasons.</li><li>6. Accuracy.</li><li>7. Image reviewer.</li></ol>

### 5.4.2 Monthly Operation Report

In addition to the Weekly Operation Report, the TISC shall provide monthly a Monthly Operation Report demonstrating compliance with all respective SLAs. The Monthly Operation Report shall accompany every monthly invoice issued during the Operation and Maintenance Phase serving as a basis to justify and calculate any performance related variable fees. Below are the requirements for the Monthly Operation Report:

No.	Requirement
	The Monthly Operation Report shall be generated and provided to SRTA to support all System performance requirements.
	The Monthly Operation Report shall provide image review performance information that shows how many images were reviewed for the selected criteria and the number of images reviewed by each image reviewer by review status/sub-status. Images that by-passed manual review and those flagged as rejects shall be reported, including but not limited to: <ol style="list-style-type: none"><li>1. For what reasons.</li><li>2. At what stage.</li><li>3. The errors.</li></ol>

No.	Requirement
	4. The stage the error was identified.
	The Monthly Operational Report shall provide information that allows SRTA to monitor the TISC image review performance against agreed SLAs as defined in Appendix E: Service Level Agreements (SLAs).
	The Monthly Operational Report shall provide information about image review performance trends.
	The Monthly Operational Report may be combined with the Monthly Maintenance Report upon TISC request and SRTA approval.

#### 5.4.3 Additional System-Generated Operational Reports

During the Term of the Contract and upon SRTA request, the TISC shall provide SRTA with up to five (5) additional system-generated operational reports SRTA may require in order to determine that the system is operationally sound, functionally efficient, and being maintained to the expected level. The TISC shall provide all resources necessary to collect data and prepare the required reports at no additional cost to SRTA at any time during the Term of the Contract SRTA requests these reports, provided that these reports do not require changes to the system's database field structure.

### 5.5 ETCS Maintenance

Whereas the Operation and Maintenance Phase shall start after the Final System Acceptance, maintenance services shall be provided by the TISC prior to Final System Acceptance during the Transition Phase: The Warranty services. Right after successful TFH RRT of each Facility Pair, the TISC shall assume maintenance responsibility, sequentially, for every part of the system that is transitioned, the network, the TFH and the roadside installations. These Warranty services shall continue to be provided until Final System Acceptance is awarded by SRTA.

The TISC shall be responsible for maintaining the ETCS to meet the required SLAs as defined in Appendix E: Service Level Agreements (SLAs). The TISC is to provide preventive, and corrective maintenance services. See Appendix E: Service Level Agreements for a detailed description of the applicability of the SRTA's SLAs during the Warranty Period (Transition SLAs) and the Operation and Maintenance Phase.

Figure 18: Maintenance Services shows the TISC's Warranty and Maintenance obligations as they evolve during the Term of the Contract.

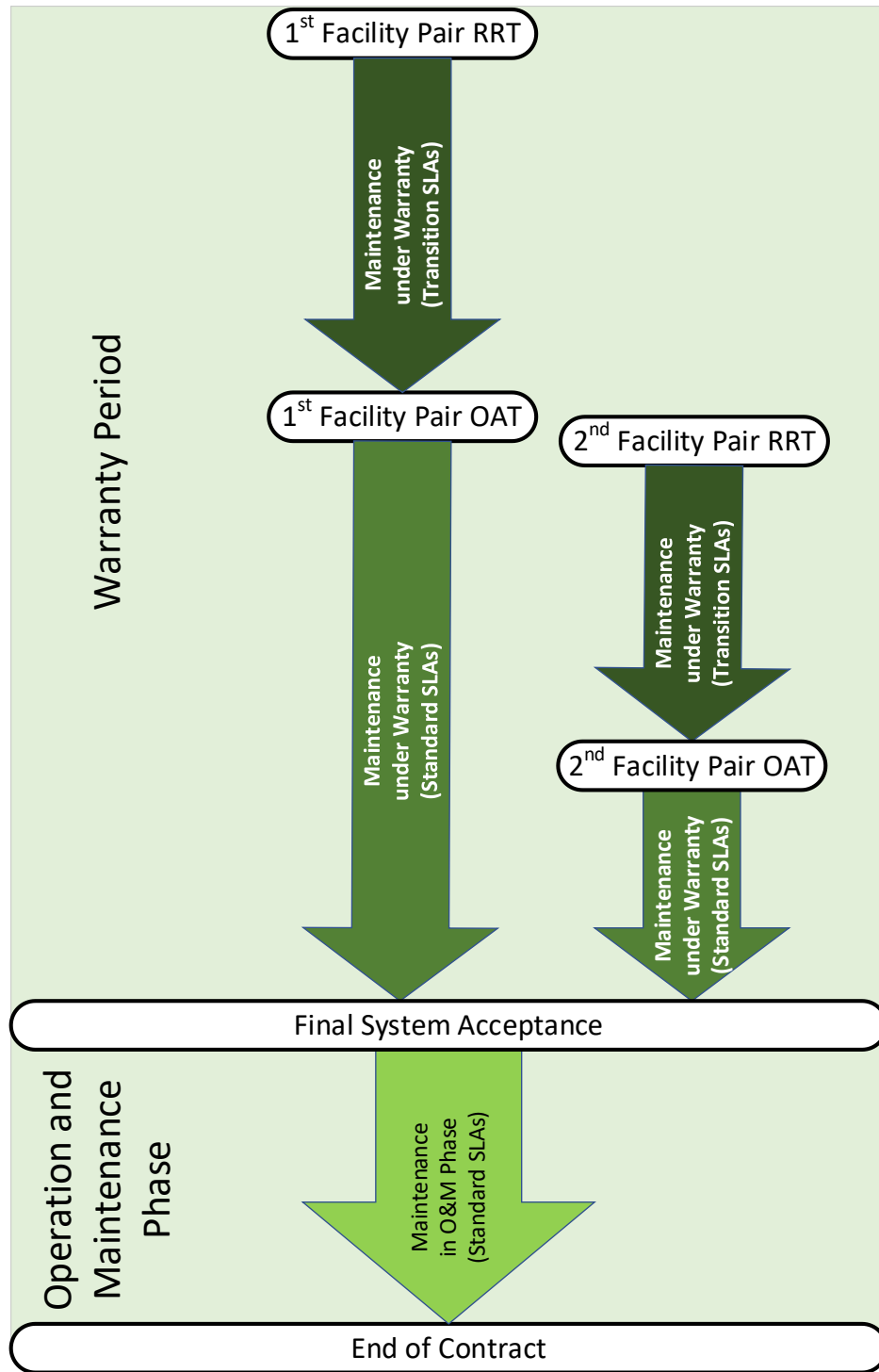


Figure 18: Maintenance Services

### 5.5.1 Warranty

The requirements for Warranty are as follows:

No.	Requirement
	The TISC shall provide Warranty for all TFH hardware and software for each toll facility pair starting from successful RRT of the TFH for a toll Facility Pair and ending with the award of Final System Acceptance.
	The TISC shall provide Warranty for the roadside sites of each toll facility starting from SRTA's approval of the FSIT and each SCT for all sites in that toll facility and ending with the award of Final System Acceptance.
	In the event Final System Acceptance is not awarded prior to the end of a manufacturer's warranty for all TISC-provided equipment, the TISC shall provide extended Warranties until FSA is awarded.
	During the Warranty period, the TISC shall be responsible for all maintenance requirements as set forth in this RFP including the fulfilment of Transition SLAs before successful OAT for each facility Pair and the fulfilment of Standard SLAs after successful OAT for each facility Pair.

### 5.5.2 Maintenance Concept

The TISC shall develop a concept on how to address and execute all necessary Preventive and Corrective Maintenance activities necessary to fulfill the requirements of this RFP and the Contract. Further, for the period between successful RRT and successful OAT for each Facility Pair, the TISC shall consider the provision of enhanced support to SRTA to ensure smooth system transition (Hypercare Support).

Below are listed the maintenance concept requirements:

No.	Requirement
	The TISC shall provide maintenance services to support all equipment, hardware, software, and network infrastructure related to the ETCS. Besides equipment installed by the TISC, this includes any already installed/existing equipment, hardware, software and network infrastructure the TISC will decide to reutilize / reuse.
	The TFH maintenance activity and Warranty shall begin at the time the TFH for the First Facility Pair completes a successful RRT.
	The roadside system maintenance activity and Warranty shall begin at the end of a successful FSIT or SCT of each roadside installation.
	For all ETCS equipment, hardware, network infrastructure, and software, including any equipment, hardware, software and network infrastructure the TISC will decide to reutilize / reuse the maintenance services shall end co-terminus with the Contract.
	The Maintenance On-Line Management System (MOMS) described in Section 2.2.5.19 shall be utilized and maintained from the beginning of Warranty through the Term of the Contract, to track, record and report all maintenance tasks and activity as well as the spare parts inventory.

#### 5.5.2.1 Hypercare Support

Once SRTA approves RRT for the TFH or FSIT or SCT for an ETCS roadside system and until SRTA approves OAT for each facility Pair, SRTA requires a heightened level of support from the TISC. This support service

is termed “Hyper-care” where the TISC is to closely monitor the system in the areas of performance, functionality, data integrity, and issue-free operation.

The requirements for Hyper-care Support are as follows:

No.	Requirement
	The TISC shall provide hyper-care support starting at the Toll Facility Host Go Live and for each subsequent ETCS toll facility Go Live. Hyper-care support shall continue through completion of OAT of that ETCS facility.
	<p>During the Hyper-care support period(s), the TISC shall submit a weekly report containing the following:</p> <ol style="list-style-type: none"> <li>1. List of all open incidents/tickets since Deployment.</li> <li>2. Ticket Status.</li> <li>3. Priority Level.</li> <li>4. Development Status.</li> <li>5. Expected Resolution Date.</li> <li>6. Comments/Updates.</li> <li>7. Next steps to resolve.</li> </ol>
	The TISC shall provide additional project resources during the Hyper-care support period(s) to monitor the ETCS toll facility 24/7, report and communicate degradation in addition to MOMS incidents, and resolve problems.
	<p>During the Hyper-care support, the TISC shall provide on-site technical support to:</p> <ol style="list-style-type: none"> <li>1. Resolve technical queries of end users working in the system.</li> <li>2. Provide issue identification, research, development, and system fixes where required.</li> <li>3. Monitor data integration points with various third-party systems and interfaces.</li> <li>4. Provide in-house operational support to resolve outstanding punch-list items.</li> </ol>
	<p>During the Hyper-care support, the TISC shall provide on-site system training and system support to:</p> <ol style="list-style-type: none"> <li>1. Provide on-site availability of the system support team.</li> <li>2. End user queries can be resolved on the spot without wasting time.</li> <li>3. Conduct on the floor training for the end users if needed.</li> </ol>
	<p>During the Hyper-care support, the TISC shall handle configuration issues and special queries such as:</p> <ol style="list-style-type: none"> <li>1. Configuring fields.</li> <li>2. Adding drop down values.</li> <li>3. Modifying field names.</li> <li>4. Changing locations of the fields.</li> <li>5. Creating custom queries (reports) in support of issue resolutions.</li> <li>6. Updating user interfaces.</li> <li>7. Adjusting system processes.</li> </ol>
	<p>During the Hyper-care support, the TISC shall ensure smooth transition of handover activities such as:</p> <ol style="list-style-type: none"> <li>1. Documentation edits.</li> </ol>



No.	Requirement
	2. Confirmation from the end users on various processes configured in the system.
	3. Handover of the application's administrator rights to the support team.

#### 5.5.2.2 Preventive Maintenance

The TISC is required to provide a preventive maintenance program that is based not only on equipment manufacturers' recommendations but also on industry best practice.

The requirements for preventive maintenance are as follows:

No.	Requirement
	All TISC preventive maintenance activities shall be carried out on a scheduled basis (daily, weekly, monthly, quarterly, and annually).
	The TISC shall provide and perform preventive maintenance on the ETCS system in accordance with the approved Maintenance Plan and the Maintenance Schedule.
	The TISC shall schedule preventive maintenance during off-peak travel times.
	The TISC shall inspect all equipment under its maintenance responsibility as illustrated in Appendix F: line of Demarcation, both major components and support components (fans, cables, connectors, cabinets, equipment racks, AC units, heaters, UPS units, storage units) and shall make such repairs, cleaning, adjustments, and replacements of components as necessary to maintain the Equipment in normal operating condition in accordance with the approved Maintenance Plan.
	The TISC shall document and obtain SRTA pre-approval for any variations or exceptions to the planned preventive maintenance activities and schedule.
	The TISC shall enter the preventive maintenance schedule into the MOMS and work orders shall be automatically created to alert TISC staff of required preventive maintenance.
	The TISC shall continually evaluate the preventive maintenance schedule, consult routinely with SRTA via reporting and regular meetings, and shall submit all recommended changes to SRTA for approval.

#### 5.5.2.3 Corrective Maintenance

All work performed by the TISC to correct equipment problems or to correct software defects such that the ETCS continually meets the requirements of the contract are considered corrective maintenance. Such problems include but are not limited to:

1. Failure of subsystem functions.
2. Problems identified by users and/or customers.
3. Interface issues.
4. Failure of processes and programs.
5. Data reconciliation issues.

6. Report issues.
7. Application failures.
8. Toll system network issues.
9. Security Vulnerabilities.
10. Degraded system or component performance.
11. Non-conforming system availability.
12. Accidents.
13. Acts of God/ Force Majeure events.

The requirements for corrective maintenance are as follows:

No.	Requirement
	The TISC shall perform corrective maintenance activities on a priority basis to identify, isolate and rectify all faults or substantial degradations in functionality or performance of the entire ETCS.
	The TISC shall provide and perform corrective maintenance on the ETCS system in accordance with the approved Maintenance Plan.
	The TISC shall provide corrective maintenance support on a 24-hour, seven (7) days a week, 365 days per year basis.
	The TISC shall perform corrective maintenance identified by any third-party audit results (e.g., quarterly roadside audits) or, as requested by SRTA.
	For all Priority Level 1 and 2 defects/ issues as outlined in Attachment E: Service Level Agreements of this RFP, the TISC shall conduct a thorough investigation and root cause analysis and submit it to SRTA within 48 hours of such defect/ issue detection.
	For all Priority Level 3 and 4 defects/ issues as outlined in Attachment E: Service Level Agreements of this RFP, the TISC shall conduct a thorough investigation and root cause analysis upon SRTA request and submit it to SRTA within 48 hours after such request is communicated to the TISC.
	The TISC shall monitor the System for failures and alarms and confirm a MOMS work order has been created for each failure as defined regardless of Maintenance Level.
	The TISC shall automate the MOMS work order process to the maximum extent possible to anticipate and automate work orders. If a MOMS work order has not been created, the TISC shall create a work order in MOMS and assign it to a technician for Maintenance action or troubleshooting.
	The TISC shall perform the necessary Maintenance and close the MOMS work order upon confirmation by SRTA that the failure has been successfully corrected. The TISC shall notify SRTA that the repair action is complete and work order has been closed.

### 5.5.3 Maintenance Resources

The provision of sufficient human and technical resources is essential to successfully accomplish the TISC maintenance obligations.

#### 5.5.3.1 Maintenance Staffing and Location

The requirements for maintenance staffing and location are as follows:

No.	Requirement
	The TISC Maintenance Staff shall include skilled personnel to fulfil the following roles: <ol style="list-style-type: none"><li>1. Operation and Maintenance Manager.</li><li>2. TFH Operation Liaison.</li><li>3. All Electronic Tolling Subject Matter Experts (SMEs).</li><li>4. Network and systems engineers.</li><li>5. Database and systems administrators.</li><li>6. Roadside Technicians.</li></ol>
	The Operation and Maintenance Manager, the TFH Operation Liaison, at least one Network and Systems Engineer and all Roadside Technicians shall reside in the proximity of the Project (Atlanta, GA) in order to fulfil response related SLAs.

#### 5.5.3.2 Maintenance Tools, Electronics and Transportation

The requirements for maintenance tools, electronics and transportation are as follows:

No.	Requirement
	The TISC shall provide all necessary vehicles to support maintenance activities within all repair and response time requirements for the ETCS for the duration of the Project.
	Vehicles shall be equipped with equipment, tools, spare parts, and consumables as necessary to meet all repair and response time requirements for the ETCS for the duration of the Project.
	The TISC shall ensure that all field staff assigned to any vehicle requiring a special operator's license are trained and appropriately certified to operate such vehicle.
	All TISC provided maintenance vehicles shall be equipped with flashing safety lights and shall display the TISC company logo such that they are easily identifiable.
	The TISC shall provide all required safety equipment when working roadside, to include safety lights and safety vests.
	The vehicles, the tools and the equipment shall be regularly inspected, maintained and replaced by the TISC in order to comply with the requirements of their manufacturer as well as Georgia State and Federal regulations.
	The TISC shall be responsible for tolls incurred during maintenance activities.

#### 5.5.3.3 Help Desk

The requirements for the TISC Help Desk are as follows:

No.	Requirement
	The TISC shall provide help desk services 24 hours every day, seven days a week.
	The TISC shall provide Help Desk and issue escalation process documentation as part of the Maintenance Plan.
	The TISC shall respond to requests within the required timeframe for all Priority Levels. Help Desk Response Time shall be in accordance with the SLAs (refer to Appendix E: Service Level Agreements).

## 5.6 Maintenance Activities

### 5.6.1 Toll Facility Host and Roadside Equipment Maintenance

The TISC shall be responsible for maintaining the Toll Facility Host and the Roadside Equipment on both Facility Pairs to the standards of this RFP.

Below are listed the basic ETCS maintenance requirements:

No.	Requirement
	The TISC shall be responsible for maintaining the ETCS to meet the required SLAs as defined in Appendix E: Service Level Agreements (SLAs).
	The TISC shall be responsible for maintaining and keeping updated the Additional THF System Instances in parallel with the Production Environment, so that ad hoc testing and ad hoc training can be provided at any time during the Term of the Contract if deemed necessary or upon SRTA request.
	The TISC shall coordinate with SRTA to gain access to any GDOT owned communication network hub buildings that are part of the ETCS. GDOT has provided and manages an access control system for secure access to all GDOT owned communication network hub buildings. GDOT is responsible for issuing the IDs to gain access to the communication network hub buildings.
	The TISC shall be responsible for following SRTA and GDOT's protocols for direct coordination with the TISC sub-contractors conducting the maintenance work.
	The TISC shall coordinate with GDOT and SRTA to deploy emergency closures to any number and combination of lanes, as needed, to facilitate any critical (Priority Level 1) repairs on short notice.
	The TISC shall prioritize all ETCS maintenance events based on the potential impact to ETCS safety, performance, operations, and revenue collection according to the Priority Levels defined in Appendix E: Service Level Agreements.
	Equipment racks and panels shall be inspected and maintained by the TISC in full operational, orderly condition, and free of debris and dirt.
	The TISC shall inspect and maintain all TISC provided equipment mounting hardware and brackets provided as a part of this RFP and shall also inform SRTA of any potential problems.
	The TISC shall inspect and maintain all pullboxes, raceways and conduits included as a part of this RFP and shall also inform SRTA of any potential problems.

No.	Requirement
	The TISC shall inspect and test cables, wiring and terminations to detect problems and degradation. Any item not in compliance with RFP and Contract requirements shall be replaced by the TISC at no cost to SRTA.
	The TISC shall maintain and repair all electrical systems downstream of the utility meter on the toll sites respective service drop.
	<p>The TISC shall repair, monitor, and maintain all hardware and software associated with, at minimum, the following:</p> <ol style="list-style-type: none"> <li>1. Zone Controllers.</li> <li>2. Lane equipment.</li> <li>3. AVI equipment and subsystems (excluding transponders).</li> <li>4. AVDC equipment and subsystems.</li> <li>5. VTS Equipment and subsystems.</li> <li>6. Permanent, portable, and mobile emergency generators in accordance with manufacturer recommendations.</li> <li>7. TFH related servers, equipment, and software.</li> <li>8. Maintenance Online Management Subsystem (MOMS).</li> <li>9. All Electronics in the roadside equipment cabinets.</li> <li>10. Roadside equipment cabinets utilized for toll systems.</li> <li>11. Equipment mounting and bracket hardware for any tolling device.</li> <li>12. CCTV camera equipment and subsystems.</li> <li>13. Traffic Sensor subsystems (MDS and RTMS).</li> <li>14. Toll Rate Dynamic Message Signs (TRDMS).</li> <li>15. AC Units / Heaters affixed to roadside cabinets.</li> <li>16. TISC supplied UPS Systems, including battery replacements.</li> <li>17. Hardware, software, and cabling associated with workstations, monitors, monitor stands, UPS units and printers used by TOC operations support.</li> <li>18. Any network equipment including switches, gbics, patch cords, patch panels, repeaters, in both the roadside toll sites and hub buildings.</li> </ol>
	All System administrative functions, if not automated, shall be performed by the TISC at regular intervals as part of the System preventive Maintenance Services according to the Approved Maintenance Plan to ensure System performance is optimized. All such System administrative functions shall be scheduled as preventive maintenance work orders through MOMS and tracked.
	The TISC is responsible for all software and firmware updates, patches, and hotfixes for all hardware and software developed, furnished and/or installed under this Contract.
	If the TISC is implementing “on-demand self-service provisioning” for its Cloud infrastructure, the TISC shall conduct a weekly audit of its Cloud services to ensure no unauthorized usage of services has occurred.
	TISC shall conduct a walk-through test of their Information Security Incident Response Plan semi-annually and separately from any disaster recovery or business continuity testing.

No.	Requirement
	The TISC shall inspect and actively treat tolling equipment cabinets (includes Toll Point sites, Travel Time sites, MDS/RTMS sites, TRCCTV sites, TRDMS sites, and generator sites), any communication network hubs under SRTA responsibility, conduit, etc. for ant, rodent, and other pest control.
	The TISC shall provide prevention, control, and eradication of weed species and weedy vine infestations by way of systemic herbicides applied within a ten (10) foot radius of all Tolling equipment (includes Toll Point sites, Travel Time sites, MDS/RTMS sites, CCTV Camera Sites, TRCCTV sites, TRDMS sites, WAN Sites, Toll Point Maintenance areas, generator sites), enclosures and utility service drops.
	The TISC shall provide on-site and off-site maintenance services.
	The TISC shall provide full time remote Help Desk support services to assist in troubleshooting, and incident/ case management for ETCS software and system issues and support.
	The TISC shall conduct weekly maintenance meetings with SRTA to report on all required system performance metrics and equipment/ system problems.
	The TISC shall provide to SRTA after-action reporting for all system and/or operational issues within ten (10) days of any issue.
	<p>The TISC shall conduct a monthly status meeting with SRTA to present and discuss the following, at a minimum:</p> <ol style="list-style-type: none"> <li>1. Monthly MOMS report.</li> <li>2. Prior month work performed.</li> <li>3. Upcoming month work to be performed.</li> <li>4. All current and/or anticipated ETCS system issues.</li> <li>5. All current and/or anticipated operational issues.</li> <li>6. All current and/or anticipated network issues.</li> </ol>
	The TISC shall accomplish all recurring tasks and fulfil all recurring requirements related to the TFH and the Roadside Equipment as described in Section 4.5.3: Information Technology Security (e.g., risk assessment, penetration testing, vulnerability scans, reporting etc.)
	The TISC shall monitor for intrusion attempts to the ETCS and prevent all unauthorized access and intrusions at all levels and report such events to the MOMS. Any intrusion, compromise or breach must be reported to SRTA within two (2) hours of detection.

### 5.6.2 Network Operation and Maintenance

The requirements for network operations and maintenance are as follows:

No.	Requirement
	The TISC shall repair, monitor, and maintain all hardware and software associated with the Network equipment and software, GBICs, FDC's, patch panels, and patch cables.
	The TISC shall maintain all roadside network equipment in toll equipment cabinets up to the first inground junction box and the SRTA utilized communication network hub buildings up to the line of demarcation with the SRTA maintained MAN (See Appendix F: <b>Error! Reference s</b> <b>ource not found.</b> ).

No.	Requirement
	The TISC shall maintain and repair all fiber, fusion splices, connectors, patch cords, FDC enclosure up to the first inground junction box outside of the toll equipment cabinet. A visual representation of TISC Maintenance responsibilities is provided in Appendix F: Line of Demarcation.
	The TISC shall provide all tools and other functions necessary to securely access each element of the network(s) from remote locations to perform issues diagnosis.
	The Tolling network management tools shall log all access and diagnostic activities, as well as changes. This logging shall include the technician's ID, date/time of the activity, and any system response. Log files shall be readily accessible.
	The TISC shall provide all diagnostic tools, software, and equipment necessary for technicians to support all network maintenance activities, including but not limited to an Optical Time Domain Reflectometer (OTDR).
	All hardware tools shall be maintained and calibrated according to the manufacturer's manual and Georgia State and Federal regulations.
	All hardware tools shall be regularly updated with the latest firmware version.
	All software tools shall be regularly updated to the latest available version.
	Network systems shall provide all test points necessary to diagnose Equipment while the Equipment is in operation.
	All network routing and switching protocols shall be consistent with those implemented by SRTA and compatible with SRTA throughout the term of the Contract.
	The TISC shall provide an industry-standard enterprise class network management and monitoring system such as SolarWinds to actively monitor all network equipment and provide notification of any network issues. This monitoring tool shall be separate from MOMs but shall interact with MOMs such that MOMs creates and maintains trouble ticket/ problem resolutions for the system. The TISC is wholly responsible for maintaining the Project roadside Tolling network to meet Project SLAs.
	The network monitoring tool shall be configured to actively monitor the logical and physical data flows, all network equipment, and processes. In the event of a problem or incident, the monitoring tool shall generate alarms and send notifications to the TISC support staff and SRTA staff.
	SRTA utilizes a network monitoring and management system (currently Netbrain) for verification of network configuration purposes. The TISC shall provide appropriate access and configuration for SRTA's network monitoring and management system to allow SRTA to map each Project's Tolling network. Log in credentials and access shall only be provided to SRTA staff based on defined user roles in the design phase. This access shall be provided prior to the start of Integration Testing. This access shall not provide SRTA staff the ability to change any of the configurations on the TISC maintained system.
	The TISC shall maintain an up-to-date log of the current configuration of each switch.
	The TISC shall accomplish all recurring tasks and fulfil all recurring requirements related to the communications network as described in Section 4.5.3: Information Technology Security (e.g. risk assessment, vulnerability scans, penetration testing, reporting etc.).

No.	Requirement
	The TISC shall monitor for intrusion attempts to the Network and prevent all unauthorized access and intrusions at all levels and report such events to the MOMS. Any intrusion, compromise or breach must be reported to SRTA within two (2) hours of detection.

### 5.6.3 Software Support Services

The TISC shall provide Software Support Services for the ETCS to ensure that it is performing, and will continue to perform, at a level that meets the performance requirements of SRTA as described in this RFP and the Contract and the accuracy and availability requirements detailed in Appendix E: Service Level Agreements.

Software Support Services shall include the provision of cloud-based services, the maintenance and update of operating systems and COTS software, monitoring of the application processes and the database(s). The requirements for Software Support services are the following:

No.	Requirement
	The TISC shall be responsible for any maintenance, daily, weekly, or periodic, required to maintain the system at operational levels (for example: purging old files, adding new tables or directories, etc.) as defined in the approved Maintenance Plan.
	The TISC shall be responsible for updating or upgrading any COTS software licenses used by the ETCS, to a version fully supported by their provider, minimum six (6) months before the installed COTS software version support period expires.
	The TISC shall be responsible for manual data retrieval, if required. This shall include transfers of transactions, images, tag files, and other files due to system or network failures.
	The TISC shall be responsible for system shutdown and re-start, if required, to keep the system operational.
	The TISC shall be responsible for re-establishment or re-installation of system files, programs and parameters, as required, following a failure or damage to the system.
	The TISC shall be responsible for the investigation and analysis of anomalies.
	The TISC shall be responsible for monitoring of programs to ensure they are running at frequencies defined in the approved Maintenance Plan.
	The TISC shall be responsible for monitoring of error and system logs at frequencies defined in the approved Maintenance Plan.
	The TISC shall be responsible for TISC Application Software, COTS software or firmware upgrades and patches, as required.
	The TISC shall be responsible for updating the Escrow with all TISC Application Software upgrades and patches, as required.
	The TISC shall engage a SRTA approved independent third party to verify yearly or after every update, the validity and usability of the source code deposited in the Escrow.
	The TISC shall be responsible for verifying daily that transactions are being generated in the lanes and these transactions are being sent appropriately to the host systems and report the status.



No.	Requirement
	The TISC shall be responsible for verifying daily that images are being generated in the lanes and these images are being transferred to the Toll Facility Host. Verify daily that the OCR is functioning correctly. Verify daily that images and OCR data is transferred to the CBO.
	The TISC shall be responsible for maintaining Cloud storage and processing performance at a level that allows the ETCS to fulfil SLA requirements at all times.
	The TISC shall be responsible for maintaining up-to-date software backups (all system software and data) at frequencies defined in the approved Maintenance Plan.

#### 5.6.4 Maintenance of Spares and Inventory Management

The TISC will be solely responsible for providing, maintaining, and tracking an inventory of maintenance spares and consumables such that the ETCS meets the requirements as set forth in this RFP. Spares are to be provided per facility and at such time as those facilities enter OAT.

ETCS asset repair/replacement that is required due to unforeseen events such as vehicle accidents, roadway construction damage, Acts of God, and/or any other scenario that, at SRTA's sole discretion it determines appropriate, will be funded by SRTA. The TISC shall ensure enough spare parts to restore any two toll gantries per Facility Pair and any three DMS per Facility Pair are kept in the inventory to exclusively serve this purpose.

The TISC is required to maintain an accurate inventory of all ETCS equipment at all times. SRTA may inspect the spares and consumables inventory at any time.

The requirements for Inventory Management are as follows:

No.	Requirement
	The TISC shall establish and maintain a dedicated local maintenance warehouse(s) that supports repair and response times described in Appendix E: Service Level Agreements (SLA).
	The TISC shall determine the location of this maintenance warehouse(s).
	The TISC-provided warehouse(s) shall serve as the primary location(s) for warehouse/ storage of any spare parts, consumables, tools, test equipment, repair parts, documentation and personnel needed to manage and support the ETCS.
	The TISC shall be liable against theft, damage, or loss of SRTA equipment in TISC possession.
	The TISC shall maintain and track the inventory of all spares and consumables required for the ETCS.
	The inventory shall include all spares located in warehouses, vehicles and in other site locations.
	During and after the Warranty period the TISC shall maintain the spare parts inventory in the MOMS and update accurate equipment inventory status in the MOMS.
	The TISC shall return all faulty parts under warranty to the manufacturer for replacement.
	The TISC shall bear all risk for loss or damage for all inventory under the TISC control.
	The TISC shall confirm the physical inventory counts match the cycle count in the Inventory Control Subsystem in MOMs at each warehouse at least two (2) times per year.

No.	Requirement
	The TISC shall perform a full physical inventory audit annually with a SRTA representative to verify accuracies between the Inventory Control Subsystem in MOMS and the actual count from all inventory locations.
	TISC shall obtain approval from SRTA prior to the disposal of any parts or equipment owned by SRTA. TISC shall coordinate and document any equipment disposals with SRTA.
	TISC shall be responsible for the proper disposal of all equipment and hardware removed from service including obsolete spare parts in accordance with Georgia Department of Administrative Services DOAS requirements.
	Upon request, the TISC shall provide information pertaining to the management of ETCS assets, including requests for inventory lists and warranty schedules.
	On an annual basis, the TISC shall update and recommend a spare part quantity to be maintained to support the ETCS functionality and operational readiness for each production facility.
	All spares procured shall be identified with a unique asset tag.
	The TISC shall keep all spare parts and components in a fully serviceable condition ready for immediate installation.
	The TISC shall purchase all spare parts in a manner to ensure that SRTA obtains the benefit of all warranties associated with such spares.
	The TISC shall configure the MOMS to provide a monthly inventory report of all SRTA assets in a specified excel file format that can be directly imported to the Enterprise Asset Management System (EAMS) of SRTA.

## 5.7 Maintenance Management and Coordination

The TISC shall be required to work with or associate with other vendors or providers in order to provide a fully integrated and operational system. The TISC shall cooperate to their fullest extent with any other vendor or provider in order to ensure that the ETCS does not conflict or cause any deterrent in capability or service to the traveling public, GDOT or SRTA.

The TISC shall organize and facilitate monthly Maintenance Coordination meetings with SRTA.

Below are the requirements for the monthly Maintenance Coordination meetings:

No.	Requirement
	The monthly Maintenance Coordination meetings shall be held in person at SRTA premises.
	The TISC Operation and Maintenance Manager shall participate and lead the meetings.
	SRTA reserves the right to invite to the meetings representatives of GDOT, SRTA subcontractors, GDOT subcontractors and other stakeholders involved in SRTA's tolling operations.
	The monthly Maintenance Coordination meetings may be combined with the monthly Operation Coordination meetings upon TISC request and SRTA approval.

### 5.7.1 Maintenance Plan

The TISC shall develop and submit to SRTA a Maintenance Plan for the Project. The Maintenance Plan will serve as the basis for all approved maintenance services to be provided by the TISC during the term of the Contract.

No.	Requirement
	The TISC shall submit a Maintenance Plan no less than 120 days prior to TFH Go Live for the first toll facility pair.
	The Maintenance Plan shall include a description of the maintenance methodology and approach.
	The Maintenance Plan shall describe all preventive and corrective maintenance that will be performed.
	The Maintenance Plan shall include maintenance repair schedules, procedures and checklists for all maintenance that will be performed.
	The Maintenance Plan shall include the complete ETCS spare parts list and procurement lead times for each part.
	The Maintenance Plan shall include a description of actions being implemented for emergency maintenance activities, including traffic control, required during peak and non-peak traffic periods, per facility.
	The Maintenance Plan shall include a description of the process for responding to unforeseen events that require lane closures for remediation.
	The Maintenance Plan shall include the communications strategy for communications with SRTA, SRTA's designees, existing TSI's, GDOT, and any 3 <sup>rd</sup> party as required by SRTA.
	The Maintenance Plan shall include a description of the Inventory Management System used to track all assets, including spare parts, associated with the ETCS facilities per the requirements in the Section 5.6.4: Maintenance of Spares and Inventory Management.
	The Maintenance Plan shall include a description and examples of the maintenance activity reports that will be provided to SRTA.
	The Maintenance Plan shall include a description of the processes and tools used for tracking all failures, root cause analysis, and corrective actions used.
	The Maintenance Plan shall specify Maintenance regions (if they exist) and warehouse locations.
	The Maintenance Plan shall specify failure Priority Levels as defined in Appendix E: Service level Agreements (SLAs) and the associated dispatching protocol for response to alarms and notifications.
	The Maintenance Plan shall include a description of the MOMS and any other systems that will be used to monitor the ETCS.
	The Maintenance Plan shall describe how the MOMS is used to track identification, dispatch, escalation, response, restoration and record of any incidents or service events.
	The Maintenance Plan shall include the following for staffing:

No.	Requirement
	<ol style="list-style-type: none"> <li>1. Organization Chart.</li> <li>2. Staffing assignments and schedule.</li> <li>3. Qualifications of all assigned staff.</li> <li>4. For all staff, the % time they are local to Atlanta, GA and the % time they are remote.</li> <li>5. For all staff, the % time they are dedicated to the Project by facility.</li> <li>6. Description of the staff training approach and plan.</li> <li>7. Description of the staff replacement approach and plan.</li> <li>8. Email and phone contact details for all assigned staff.</li> </ol>
	<p>The Maintenance Plan shall describe all SRTA-approved TISC maintenance subcontractor agreements or arrangements to include:</p> <ol style="list-style-type: none"> <li>1. Entity contracted.</li> <li>2. Scope of work.</li> <li>3. Description of qualifications or licensing.</li> <li>4. Term of the Contract.</li> </ol>
	The Maintenance Plan shall include a Maintenance Schedule that contains key activities.
	The Maintenance Schedule shall include the preventative maintenance activities the TISC will perform for all system components for all facilities.
	The Maintenance Schedule shall provide a description of the preventative maintenance activities to be performed, expected duration, and the frequency.
	As part of the Maintenance Plan and on an on-going basis, the TISC shall develop a preventive maintenance schedule, which represents the levels of effort, activities, resources, schedules, etc. required to fulfill the TISC's preventive maintenance responsibilities.

#### 5.7.1.1 Maintenance Communication Plan

With the purpose to facilitate clear and efficient communication between stakeholders, the TISC shall maintain within the Maintenance Plan a Maintenance Communication Plan, which shall be an evolution of the respective plan included in the PMP focusing on maintenance communication matters. Communication procedures with at least the following stakeholders shall be considered in the Maintenance Communication Plan:

- SRTA.
- GDOT.
- Commercial Backoffice provider.
- Georgia Tech

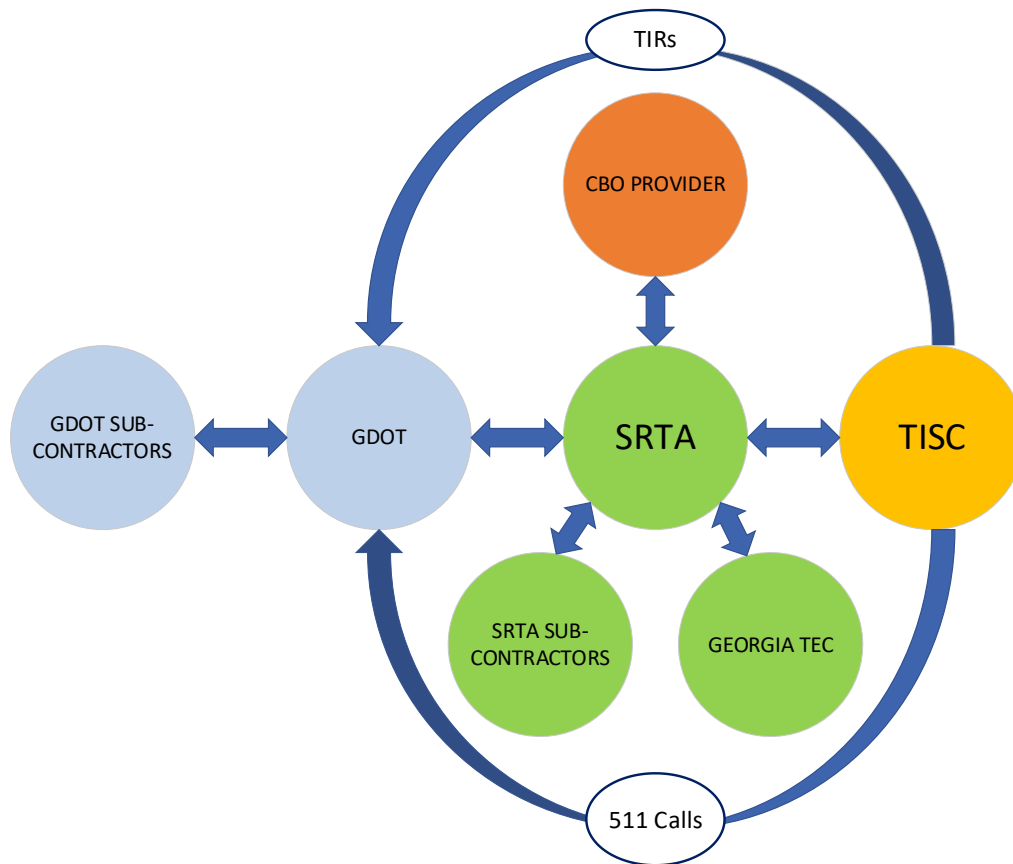


Figure 19: Maintenance Communication Diagram

### 5.7.2 Data Retention Plan

The TISC shall develop and maintain within the Maintenance Plan a Data Retention Plan, in order to ensure that data is kept safe, easily accessible and it can always be recovered and become accessible within reasonable period of time in case of temporary loss.

Below are the requirements for the Data Retention Plan:

No.	Requirement
	The Data Retention Plan shall consider a reasonable balance between live and archived data.
	The Data Retention Plan shall include a description of the data back-up process.
	The Data Retention Plan shall include a description of the data archiving process.
	The Data Retention Plan shall include a description of the data recovery process.

### 5.7.3 Maintenance Plan Updates

The TISC shall submit for SRTA approval an updated Maintenance Plan (including the Maintenance Communication Plan) on an annual basis that includes any new operational practices and newly installed hardware/software that may affect the TISC's maintenance activities. The TISC shall also update the Maintenance Plan between the regular annual updates to reflect important and necessary changes to the

policies or procedures for the ETCS Maintenance and Software Support Services triggered by changes implemented to the ETCS (major technology changes/upgrades) or by changes to the regulatory framework.

Below are the requirements for updating the Maintenance Plan:

No.	Requirement
	The update shall occur on an annual basis or more frequently if there are changes in applicable policies and procedures.
	The TISC may request approval from SRTA if it determines during its annual review of the Maintenance Plan that no changes are necessary.
	All updates or changes to the Maintenance Plan shall be submitted for review and acceptance by SRTA prior to incorporating the proposed changes or updates.
	No actions shall be taken by the TISC regarding any proposed changes and/or updates without prior written acceptance by the SRTA.
	All proposed changes and updates must be directed to the most current version of the Maintenance Plan.

#### 5.7.4 Plans' Maintenance and Updates

Besides the Operation Plan and the Maintenance Plan, the TISC shall maintain and update all Plans necessary to operate and maintain the Project on a regular basis or ad hoc to reflect any changes to the policies or procedures related to each plan. The changes may relate to improvements proposed by the TISC or changes implemented by SRTA or other involved stakeholders, that need to be incorporated in the plan.

The following plans shall be maintained throughout the Term of the Contract:

1. Training Plan.
2. Traffic Control Plan.
3. Document Management Plan.
4. Quality Management Plan.
5. Safety Plan.
6. Risk Management Plan.
7. Issues Management Plan.
8. Change Management Plan.
9. Escalation Plan.
10. Incident Response Plan.
11. Disaster Recovery Plan.
12. Data Retention Plan.

13. Information Technology System Security Plan (SSP).
14. Continuity of Operations (COOP) Plan.
15. Cyber Incident Response Plan (IRP).
16. Information System Contingency Plan (ISCP).
17. Data integrity Assurance Plan.
18. Configuration Management Plan.
19. Information Security Incident Response Plan.
20. Succession Plan.
21. Non-COTS Source Code Management Plan.

Below are the requirements for updating the plans:

No.	Requirement
	The update shall occur at a minimum on an annual basis or more frequently if there are changes in applicable policies and procedures.
	The TISC may request approval from SRTA if it determines during its annual review of a Plan that no changes for this specific plan are necessary.
	All updates or changes to each Plan shall be submitted for review and acceptance by SRTA prior to incorporating the proposed changes or updates.
	No actions shall be taken by the TISC regarding any proposed changes and/or updates without prior written acceptance by the SRTA.
	All proposed changes and updates must be directed to the most current version of each Plan.

#### 5.7.5 Documentation Maintenance and Updates

The TISC shall continuously update all Project Documentation (As-Built) so as to provide a complete record of the as-built status of the ETCS after performing any changes and/ or improvements to the Roadside Installations and the TFH Hardware and Software.

The Project Documentation to be updated shall include, but not be limited to:

1. Schematics.
2. Logic diagrams.
3. Equipment layouts.
4. Wiring diagrams.
5. Interconnection diagrams.
6. Attachment hardware details.
7. Installation diagrams.

8. Cable schedule.
9. Interface details.
10. Network diagrams.
11. User manuals.
12. Maintenance manuals.

The TISC shall also continuously update all Operation and Maintenance Manual as well as other training content so that they provide correct guidance based on the latest as-built status of the ETCS.

## 5.8 Maintenance Reporting

### 5.8.1 Monthly Maintenance Report

One Monthly Maintenance Report (MMR) shall be submitted to SRTA during the Operation and Maintenance phase of the Project. The Monthly Maintenance Report shall accompany every monthly invoice issued during the Operation and Maintenance Phase serving as a basis to justify and calculate any performance related variable fees. Below are the requirements for the Monthly Maintenance Report:

No.	Requirement
	The TISC MMR shall contain three sections: one for SLAs associated with the TFH, one with the SLAs associated with the facility pair on I-75 and one with the SLAs associated with the facility pair on I-85.
	The TISC shall submit the Monthly Maintenance Report (MMR) to SRTA beginning at the end of the first full calendar month after Go Live of the Facility's TFH for TFH SLAs and after approval of each Facility's FSITs or SCTs for Roadside SLAs, as applicable, and every month thereafter for the term of the Project.
	The TFH MMR shall include a summary pass/ fail assessment of compliance and detailed assessment measuring actual SLA's and applicable LD's, if any, for all SLAs associated with the TFH.
	The Roadside MMRs shall include a summary pass/fail assessment of compliance and detailed assessment measuring actual SLA's and applicable LD's, if any, for all SLAs associated with the roadside systems on I-75 and I-85 for all roadside equipment under the control of the TISC for the month it is being submitted.
	The TISC shall propose the methods for measuring and reporting on the SLAs during the Design and Development Phase of the Project for SRTA review and approval.
	The TISC shall submit the MMRs before the 15th day after the end of the prior month.
	The TISC shall respond to comments submitted by SRTA on the MMRs within 5 business days.
	At least 45 days prior to the first TFH Go Live, the TISC shall submit the TFH MMR template for SRTA review and approval.
	At least 30 days prior to the first FSIT for a facility pair, the TISC shall submit the Roadside MMR templates for SRTA review and approval.



No.	Requirement
	<p>MMRs shall include the following, at a minimum:</p> <ol style="list-style-type: none"> <li>1. A summary table of all monthly performance measurements, the required SLA, the SLA achieved and any corresponding Liquidated Damages (LD) for all required SLAs.</li> <li>2. Descriptions of exceptions and/or exclusions for all required SLAs.</li> <li>3. Monthly MTBF measurements.</li> <li>4. Historical SLA performance for at least the 12-month period, including graphical representations/charts of target SLA values versus actual SLA values for each SLA.</li> <li>5. TISC calculated monthly Liquidated Damages (LDs), including evidence to justify LD reductions for any single event that causes cumulative LDs as described in Appendix E: Service Level Agreements (SLAs).</li> <li>6. Response and repair time calculations, including exceptions and justifications.</li> <li>7. Access to all reports/ data used by the TISC in support of the MMR to address performance requirements as described in Appendix E: Service Level Agreements Corrective and preventive maintenance activities performed each month.</li> <li>8. All Work Orders generated for the past month.</li> <li>9. All Work Orders created as a direct result of scheduled maintenance activities.</li> <li>10. All Work Orders created that were placed in a hold status and the reason for the hold status.</li> <li>11. The status of all Work Orders opened, completed or in progress during the past month, including the assigned technician's response and associated repair times.</li> <li>12. A list of all RCAs performed during the past month.</li> <li>13. Quarterly information on the battery health of all UPS equipment.</li> <li>14. Dates and results of all weekly generator checks.</li> <li>15. Inventory reports.</li> <li>16. Work Plan, including Preventive Maintenance activities, for the upcoming month.</li> <li>17. All planned, approved and completed CRF's.</li> <li>18. The planned method for demonstrating SLA compliance, updated as needed and approved by SRTA.</li> <li>19. Status on all open Change Orders and open Help Desk assignments.</li> </ol>
	The Monthly Maintenance Report may be combined with the Monthly Operational Report upon TISC request and SRTA approval.

### 5.8.2 End-of-Life Assessments

End-of-Life assessments are to be conducted to ensure the ETCS is supported by the manufacturers for the Term of the Contract.

The requirements for End-of-Life Assessments are as follows:

No.	Requirement
	Annually, the TISC shall check that all COTS and custom software or hardware remains supported by its original manufacturer and is not reaching end of life within the next year.

No.	Requirement
	Annually, the TISC shall submit for SRTA review and approval a checklist of all COTS and custom hardware or software identifying which, if any, are reaching end of life within the next year.
	If the end of life is announced for any installed COTS, custom software, or hardware products, the TISC shall make the necessary changes to support a replacement COTS product expected to be supported for at least the duration of the Contract.
	The TISC shall update ETCS software and hardware to support any changes in third-party interface communications (e.g., ICD) and industry standards.
	For modifications to industry standards that warrant addressing to maintain required security, communication, safety, and performance of the ETCS, the TISC shall immediately notify SRTA and shall propose an update or replacement equal or better than the current COTS or custom software or hardware.

### 5.8.3 Additional System-Generated Maintenance Reports

During the Term of the Contract and upon SRTA request, the TISC shall provide SRTA with up to five (5) additional system-generated maintenance reports SRTA may require in order to determine that the system is operationally sound, functionally efficient, and being maintained to the expected level. The TISC shall provide all resources necessary to collect data and prepare the required reports at no additional cost to SRTA at any time during the Term of the Contract, provided that these reports do not require changes to the system's database field structure.

## 5.9 Audits

SRTA may require various audits for both financial and performance data regarding the Roadside and Toll Host. These audits may address such items, but not be limited to the following:

1. Internal procedures.
2. Revenue and reporting.
3. Facility inspections.
4. System processing and performance.

The TISC shall completely support SRTA in any audit activity relating to the ETCS.

Further, at times SRTA may conduct an audit or request assistance during a state audit.

The TISC shall meet the following requirements:

No.	Requirement
	The TISC shall consider adequate technical resources to provide ad hoc reporting support, including supply of data and creating queries, and organize TISC facilitated meetings to explain system functionality to SRTA's designated auditors.

No.	Requirement
	The TISC shall provide the required resources for audit support within two (2) business days of SRTA's request for support.
	The TISC shall cooperate with 3 <sup>rd</sup> parties as requested by SRTA for audit support.
	The TISC shall support unplanned audits by SRTA for all SRTA ETCS assets.
	The TISC shall propose all necessary corrective actions to address audit findings within twenty-four (24) hours of audit conclusion.
	The TISC shall execute all SRTA approved corrective actions to address audit findings within thirty (30) days of approval.

### 5.10 Continuous Improvement Program

The TISC shall develop and participate in a Continuous Improvement Program (CIP). The intent of the CIP is to realize improvements in system and operations that will benefit SRTA. SRTA considers benefits to include elements related to:

1. Increasing revenue.
2. Decreasing operating costs.
3. Improving the customer experience.
4. Improving data management, reporting, and auditability.
5. Enhancing the efficiency and safety of ETCS and ETCS operations.

The TISC shall organize and facilitate Semester CIP Meetings in the first year after System Acceptance and Annual CIP Meetings thereafter to support the program.

The requirements for the CIP are as follows:

No.	Requirement
	The TISC shall participate with SRTA in a Continuous Improvement Program (CIP).
	The TFH Operations Liaison shall participate in the CIP.
	The TISC shall meet with SRTA to identify elements of the ETCS and/or the TISC's operations that could be improved to the benefit of SRTA.
	The TISC shall schedule, conduct, and document CIP meetings with SRTA annually, with the first to occur no later than one year after System Acceptance of the first ETCS toll facility pair.
	<p>Within four (4) weeks of each meeting the TISC shall provide SRTA with a written Proposal including the following elements:</p> <ol style="list-style-type: none"> <li>1. A description of the element(s) of the ETCS and/or TISC's operations that the TISC has identified for improvement. The description shall include how the TISC will go about achieving the improvement(s), including all work necessary, changes to ETCS, software, or equipment, and any required coordination or involvement from SRTA.</li> </ol>

No.	Requirement
	<ol style="list-style-type: none"> <li>2. A specific improvement goal(s), which clearly indicates both the current performance level for the element(s) and the proposed improved performance level.</li> <li>3. How the performance of the element(s) will be tracked and measured. When applicable, improvements shall be driven by measurable performance characteristics. Results shall be measured to document performance improvements. To the extent practical, all measured performance characteristics shall be based on objective criteria. TISC shall clearly describe how SRTA will be able to review and validate the performance of the element(s).</li> <li>4. A detailed description of benefits to SRTA and/or SRTA's customers that would result from the improvement(s). If possible, the description of benefits shall include a financial analysis of how the proposed improvement(s) would result in greater revenue, lower costs, or both.</li> <li>5. A detailed precedent-oriented schedule presenting the activities required to realize the proposed improvement, including the time frame over which the improvement will be measured and the date by which the improvement goal will be reached.</li> <li>6. A description of how the TISC will maintain the improved element(s) at the higher performance level.</li> <li>7. A detailed cost estimate to implement the improvement. The cost shall include the TISC's labor, materials, and other costs as applicable.</li> </ol>
	If SRTA requests modifications to the proposal, the TISC shall provide a revised proposal to TISC within four weeks.

## 5.11 Succession Services

The TISC shall, upon SRTA's written notice:

1. Furnish transition services for up to eighteen (18) months before the ETCS Contract expires.
2. Negotiate in good faith an agreement and plan with a successor to determine the nature and extent of transition services required.

The TISC shall consider as included in this Project all services that need to be provided without interruption until Project expiration or termination that shall allow a successor, either SRTA or another Toll Contractor named by SRTA, to replace the ETCS.

The TISC shall participate in coordination and planning of the turnover of the ETCS. The TISC shall commit to cooperation with the succeeding Toll Contractor by providing unrestricted database access, support for data migration, testing and any other service necessary to ensure an orderly and efficient transition to a future Toll System.

For this purpose, the TISC shall prepare and submit a Succession Plan before Final System Acceptance.

The Succession Plan is to define the activities and deliverables necessary for the TISC to turn over all ETCS facilities, subsystems, data, project assets, and artifacts. It is also to define the handoff of all operational and maintenance processes and procedures as well as all other information required to enable SRTA, or SRTA's designee, to operate and maintain all ETCS facilities.

The requirements for the Succession Plan are as follows:

No.	Requirement
	The TISC shall provide a Succession Plan for SRTA review, comment, and approval per the schedule defined in Appendix H: Deliverables Schedule that the TISC will execute at the end of the Contract.
	The Succession Plan shall define the activities and deliverables necessary for the TISC to turn over to SRTA, or SRTA's designees, all ETCS facilities, subsystems, data, Project assets, records, and artifacts.
	The Succession Plan shall include a description of the handoff of all operational and maintenance processes and procedures.
	The Succession Plan shall include a cutover period with minimal interruption in the processing of tolls, financial reporting, and auditing.
	The Succession Plan shall include a cutover period with no lost transactions and no lost access to the ETCS data and reports.
	<p>The Succession Plan shall address the following:</p> <ol style="list-style-type: none"> <li>1. Proposed TISC and Successor Responsibilities.</li> <li>2. Hand-off Strategy including the document management system and the turnover of bidirectional traceability (RTM) for requirements, design docs, test procedures, and training materials.</li> <li>3. Process for Conversion at Lane Level.</li> <li>4. Potential Infrastructure Services Issues.</li> <li>5. Potential Equipment Support Structure Issues.</li> <li>6. Proposed Data Migration Plan.</li> <li>7. Non-COTS Source Code Management Plan.</li> <li>8. Proposed Successor Host Access Security.</li> <li>9. Assurance Strategy for Continuous Disaster Recovery.</li> <li>10. Training for System Administration and Maintenance.</li> <li>11. Risk Matrix with Assessed Probabilities and Mitigation Strategies.</li> </ol>
	The Succession Plan shall include an end-of-Project checklist verifying all products are the current version and include any executed service contracts.
	The TISC shall provide sufficiently experienced resources during the transition period to ensure the continuity, consistency and level of proficiency of the services required.
	The Succession Plan shall specify a training program and a date for transferring responsibilities for each division of Work described in the plan.
	The Succession Plan shall be executed with the objective of a seamless transition with minimal service interruption.