RICHMOND METROPOLITAN TRANSPORTATION AUTHORITY

REQUEST FOR PROPOSAL NO. TSS - 2017

FOR

TOLL SYSTEM & SERVICES

March 24, 2017

DEADLINE FOR SUBMISSION OF PROPOSALS
June 21, 2017 at 1:00 p.m.

A Mandatory Pre-proposal Conference and Site Tour is scheduled for 9:00 a.m. on April 6, 2017 (see section 3.1 within)

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1. INTRODUCTION

1.1. Purpose:

The Richmond Metropolitan Transportation Authority ("RMTA" or the "Authority"), is soliciting proposals from qualified, experienced firms for the provision of an upgraded Toll Collection System. RMTA's purpose is to establish an agreement with the firm best suited to meet the needs and requirements of RMTA, as set forth herein. RMTA intends to select a firm whose terms will provide the best value to RMTA based upon the criteria set forth in this Request for Proposals (RFP), in delivering the overall combination of quality, price, and various elements of required services that in total are optimal relative to RMTA's needs.

RMTA reserves the right, however, to reject any and all responses received, to waive any irregularity or informality and to select the proposal deemed to be in the best interest of RMTA.

1.2. Location and Peak Hours:

The work to be performed is at the Authority's toll facilities located in and around Richmond, Virginia ("Toll Facilities").

Figures 1-1 and 1-2 provide locational information, traffic counts, and price pertaining to the Toll Facilities. Tolling Specification 06 describes lane-specific configurations including the tolling equipment for on and off-ramps.

Peak hours of operations are on weekdays as follows:

- Downtown Expressway Eastbound: 6:00AM to 10:00AM

- Downtown Expressway Westbound: 3:00PM to 7:00PM

- Powhite Parkway Northbound: 5:00AM to 10:00AM

- Powhite Parkway Southbound: 3:00PM to 7:00PM

- Boulevard Bridge: 6:00AM to 9:00AM and 3:30PM to 7:00PM
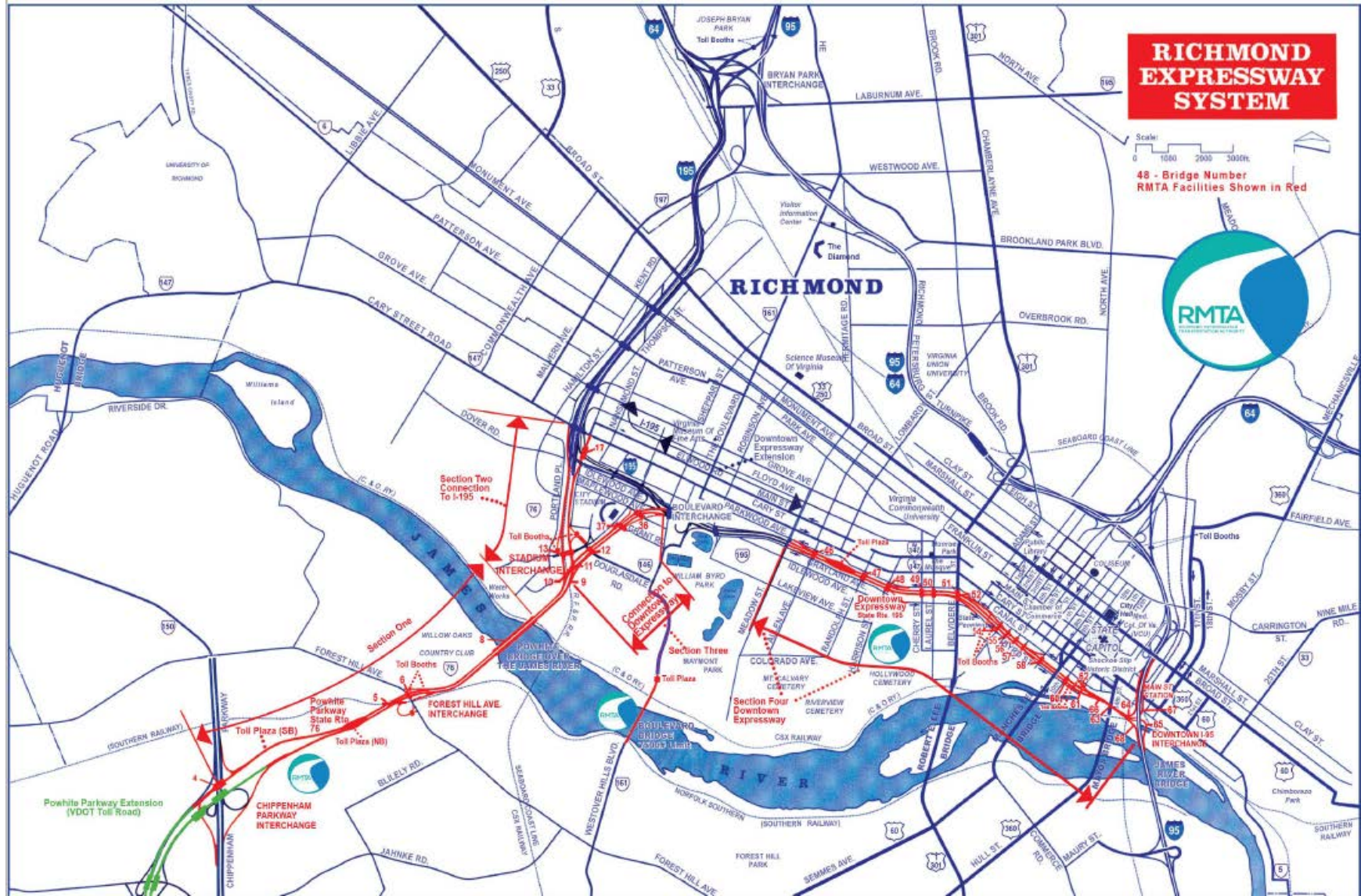
Figure 1 -1. RMTA Expressway System

Figure 1 -2. Current Tolling Locations

Downtown Expwy. (DTE)
Lanes 43-46 (TL) , 47-49 (ORT)
WB Mainline, $0.70

TL: ADT = 9.1K vehicles
      Peak 2 hr. (PM) = 2.9K vehicles

ORT: ADT = 15.2K vehicles
      Peak 2 hr. (PM) = 9.4K vehicles

Douglasdale
Lane 25
SB off-ramp, $0.20

ADT = 0.6K vehicles
Peak 2 hr. (PM) = 0.1K

Douglasdale
Lane 23
NB on-ramp, $0.20

ADT = 1.2K vehicles
Peak 2 hr. (AM) = 0.4K

2nd Street
Lane 62
WB off-ramp, $0.35

ADT = 1.4K vehicles
Peak 2 hr. (AM) = 0.4K

12th Street
Lanes 72 & 74
WB off-ramp, $0.30

ADT = 2.5K vehicles
Peak 2 hr. (AM) = 1.5K

Powhite Parkway
Lanes 1-7 (TL), 90-92 (ORT)
SB Mainline, $0.70

TL: ADT = 15.2K vehicles
      Peak 2 hr. (PM) = 4.9K vehicles

ORT: ADT = 25K vehicles
      Peak 2 hr. (PM) = 9.3K vehicles

Forest Hill
Lanes 16, 18, 20 & 22
SB off-ramp, $0.70

ADT = 7.7K vehicles
Peak 2 hr. (PM) = 2.6K

Downtown Expwy. (DTE)
Lanes 50-57 (TL)
EB Mainline, $0.70

ADT = 23K vehicles
Peak 2 hr. (AM) = 11.3K vehicles

Forest Hill
Lanes 19&21
NB on-ramp, $0.70

ADT = 3.2K vehicles
Peak 2 hr. (AM) = 1.1K

2nd Street
Lane 61
EB on-ramp, $0.35

ADT = 1.3K vehicles
Peak 2 hr. (PM) = 0.3K

Powhite Parkway
Lanes 8-14 (TL), 93-95 (ORT)
NB Mainline, $0.70

TL: ADT = 14.6K vehicles
      Peak 2 hr. (AM) = 3.7K vehicles

ORT: ADT = 22.6K vehicles
      Peak 2 hr. (AM)= 11.6K vehicles

Forest Hill
Lanes 15&17
NB on-ramp, $0.70

ADT = 3.4K vehicles
Peak 2 hr. (AM) = 1.3K

Boulevard Bridge
Lanes 31-36 (5 physical)
NB & SB Mainline, $0.35

ADT = ~5.8K vehicles each way
Peak 2 hr. = 1.7K NB AM, 1.8K SB PM

11th Street
Lanes 71 & 73
EB on-ramp, $0.30

ADT = 2.9K vehicles
Peak 2 hr. (PM) = 1.7K

ADT = Average Daily Traffic
AM, PM = time of day
NB, EB, SB, WB = direction of travel
ORT = Open Road Tolling
TL = Traditional Lane

Red denotes locations with zero on-site staff

1.3. Project:

The primary goal of this project is to provide a more advanced and maintainable system for the accurate collection, processing and audit of tolls (the "Toll Collection System" or "System"), system interfaces to the VDOT Customer Service Center (which processes RMTA's electronic tolls), report generation and security of the System while providing a comprehensive and trouble-free transition from the existing toll collection system.

RMTA intends to procure a Contractor (defined as the prime contractor/toll system integrator selected and responsible for designing, installing, testing and maintaining the Toll Collection System) to upgrade RMTA's Toll Collection System ("System") and to provide maintenance services for the upgraded System. The upgrade consists of the replacement and enhancement of elements of the current Toll Collection System and to produce a successfully designed, developed and tested System that is accepted by RMTA and placed into revenue service in sufficient time to meet the designated schedule.

The objectives of this procurement include but are not limited to:
- Replacement of existing ETC/cash equipment that is nearing the end of its useful life including current lane controllers, as well as all plaza, host and back office systems; in addition, as determined by the RMTA, certain in-lane equipment and components are to be replaced while some will be re-used
- Improving overall System performance and reliability and security
- Promoting maximum cost efficiency to support the Authority's goals of reducing congestion during peak travel periods
- Providing the highest level of customer service
- Coordination of all System maintenance and consolidation of System maintenance at the Powhite ORT and all other Toll Facilities where efficient and practical
- Promoting maximum ETC usage to support the Authority's goals of increasing E-ZPass transponder usage
- Providing for additional installations of the System if and where required

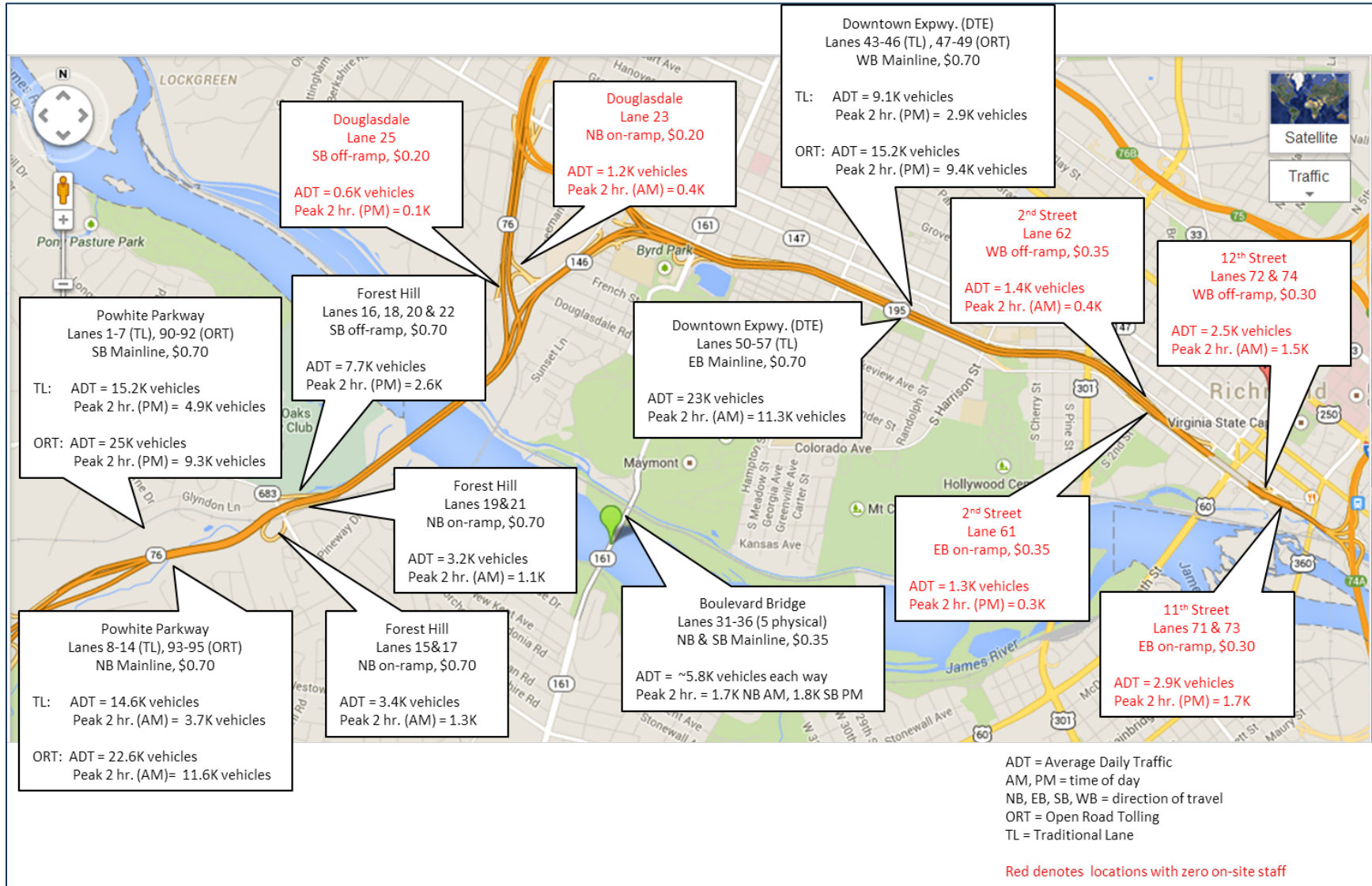From this procurement, RMTA intends to enter into an agreement with a single firm ("Contractor") responsible for both:
- Designing, installing, integrating and testing the upgrades of and replacements to the Authority's current toll collection system to provide the Authority with the function, reliability, availability, serviceability and performance specified herein

- Maintaining the System to provide the Authority with the function, reliability, availability, serviceability and performance specified herein

Accordingly, the procurement is structured to consist of the following elements:
- Base Work.
  - Furnish, install and maintain toll equipment, ancillary equipment and related software for Open Road Tolling (ORT) facilities at the Downtown Expressway and the Powhite Parkway plazas.

- o Furnish, install and maintain toll equipment, ancillary equipment and related software for existing Cash/Traditional lanes at all RMTA plaza and ramps.
        - o Any work related to the alternative approach to the full Automatic Coin Machine (ACM) replacement scenario described based on the re-use of existing (CS Route M5) ACMs at some locations.

- Extra Work
        - o Additional work outside of "base work" scope.

Certain provisions relating to the scope of work and technical requirements are further detailed in the Tolling Specifications documents (pages numbered TS-xx) and their respective appendixes provided as part of this Request For Proposals ("RFP").

Proposers shall submit a proposal response to perform the Base Work with all required forms and information as detailed in Section 6: "Form of Proposal" below.

1.4. Procurement Documents:

The Authority's Request For Proposals consists of the following:

- This document (page numbers starting with "RFP-") and its exhibits, where
        - o Section 1 contains general information
        - o Section 2 describes the minimum qualifications that a Proposer must have in order to be eligible for Contract award
        - o Section 3 details the key roles within the Authority during this procurement and the Proposers' expected interaction with same
        - o Sections 4 and 5 describe the anticipated schedule of this procurement, milestones, and work specified under Contract
        - o Section 6 details the required format of each Proposer's response to this RFP
        - o Sections 7 through 13 describe the considerations, criteria and process the Authority will use to evaluate proposals and make any award of the Contract
        - o Section 14 details additional terms and conditions of this procurement
        - o The exhibits to this document provide the various forms required in order for a Proposal to be considered by the Authority

- The Contract document (page numbers starting with "Exhibit-H-XX") and its attachments including but not limited to the software license agreement
- The Tolling Specifications documents (page numbers starting with "TS-") and their appendices detailing the scope of work and Authority requirements related to the work
- The Exhibits documents referenced throughout the document start with "EXHIBIT-"

1.5. Resulting Contract:

This procurement will result in an agreement covering implementation of the System and associated maintenance. The form of agreement is contained in Exhibit H. The complete agreement RMTA wishes to execute as a result of this procurement is provided as part of this

RFP and is referred to in this RFP as the "Agreement" or the "Contract". RMTA reserves the right, whichever best serves the interests of RMTA, to:

- Award the resulting Contract and provide Notice To Proceed for the Base Work alone
- Award the resulting Contract and provide Notice To Proceed for Base Work and Extra Work
- Decline to make a Contract award based on the Proposals received

1.6. Governing Law:

This procurement and all resulting contracts and change orders shall be governed by the laws of the Commonwealth of Virginia, including but not limited to the Virginia Public Procurement Act, Va. Code §2.2-4300 et seq. The Authority shall select the fully qualified Proposer which, in the Authority's opinion, has made the offer best suited to the Authority, and shall award the Contract to that Proposer. The award document will be a contract incorporating by reference all the requirements, terms and conditions of this RFP and the Proposer's Proposal as negotiated.

In accordance with § 2.2-4359D of the Act, the Authority may cancel this Request for Proposals (or any portion thereof) or reject Proposals at any time prior to an award and the Authority is not required to furnish a statement of the reasons why a particular Proposal was not deemed to be the most advantageous.

The Proposer shall comply with all applicable Federal, State and local laws and regulations, including rules and regulations of RMTA. If any funds are received from federal or state grants, the Proposer shall comply with all applicable requirements of such grants.

1.7. Taxes, Permits and Licenses:

Each Proposer shall be responsible for determining any and all sales, employment, use, personal property, or any other tax responsibilities that may be incurred through any contracts, transactions, deliveries, or performance of services resulting from this RFP prior to submitting a Proposal. Any and all such taxes due are the sole responsibility of the selected proposer and in no case shall the Authority accept, assume, or in any way be responsible or liable for same, unless specifically provided for in the resulting contract.

The selected Proposer shall obtain and maintain at their own expense all necessary permits and other licenses to comply with all applicable laws, Federal, State or municipal, along with all regulations, and ordinances of any regulating body.

2. MINIMUM QUALIFICATIONS

Each Proposer must have the following minimum qualifications:

- ORT Experience: Three (3) or more installations currently operating in revenue collection, at least one of which has to be three (3) or more adjacent or separate travel lanes

- Cash Lane Experience: Two (2) toll agencies that rely on the Offeror's software for "mixed mode lanes" where, in a single toll lane, during any period of time, random motorists will pay their toll using an ETC transponder and the remainder will pay their toll by directly depositing coins into an Automatic Coin Machine.
- VES Experience: Two (2) installations with violation enforcement systems in non-ORT E-ZPass Only lanes.
- Maintenance Experience: Two (2) active contracts with toll agencies or concessionaires where the Proposer is currently providing comprehensive maintenance of hardware and software for a toll collection, violations enforcement and audit system where such maintenance services have been provided for at least three (3) years in at least one contract.

Such qualifications shall be clearly identified and detailed in Exhibit D of the Proposal. Please note that subcontracting and assignment must conform with Exhibit H, Section 8.1

In addition, each Proposer shall identify the following Key Staff:

- Project Manager
- Quality Manager
- O&M Manager

The following Key Staff shall possess the minimum qualifications described below:

- The Project Manager shall have at least five (5) years of experience managing similar projects in the toll collection industry or related industry and at least two (2) years of experience managing roadway tolling projects.

- The Quality Manager shall have at least five (5) years of experience in quality assurance and testing on similar projects in the toll collection industry or related industry and at least two (2) years of experience as quality manager on a roadway tolling project.

3. INTERACTION WITH THE AUTHORITY

All Proposers are hereby placed on notice that neither RMTA, nor its board members, officers, employees or agents shall be lobbied either individually or collectively specifically regarding this RFP. Proposers, consultants and/or their representing agents are hereby advised that they are not to contact members of the Richmond Metropolitan Transportation Authority board or staff members for such purposes as holding meetings of introduction, conduct presentations, orientations or demonstrations, meals, etc., if they intend to submit, or have submitted a Proposal. Any firm contacting individuals mentioned herein for these or related purposes shall be in violation of this warning and may be disqualified from further consideration under this RFP.

The Authority representatives identified in the RFP are the sole contacts for any and all inquiries and questions after this RFP has been issued.

3.1.Pre-Proposal Conference and Site Tours:

All Proposers are required to contact the Pre-Proposal Conference/Site Tour Coordinator prior to the meetings and site visits described below to confirm their attendance at the Mandatory Pre-Proposal Conference/Site Tour, provide the names and contact information of their representatives that will be attending, and indicate their attendance at additional Pre-Proposal Site Tours. Such information should be provided at least three (3) days prior when possible to:

>Paula Watson, Pre-Proposal Conference/Site Tour Coordinator
>RE: RFP NO. TSS – 2017
>919 E Main Street, Suite 600
>Richmond, VA 23219
>804.523.3308
>Email: Paula.Watson@rmtaonline.org

Proposers shall note that the site tours detailed below will be the only site visits allowed. Proposers are encouraged to bring measuring equipment, cameras and all other equipment necessary to gather the required information necessary to prepare and submit a bid. All persons shall bring and wear a safety vest on the outside of their clothing at all times during the site visit.

Such safety vests must be compliant with ANSI/ISEA 107-2015 (Class III safety vests).

3.1.1. Mandatory Pre-Proposal conference/Site Tour:

All Proposers MUST attend the Mandatory Pre-Proposal Conference/Site Tour shown in the Schedule of Events (Section 4). The conference and site tour will start at the RMTA's Powhite South Administrative Building (coordinates: 37 31' 52.08" N, 77 31' 06.98" W) in Richmond, Virginia. Any Proposer not present or represented at this conference and site tour shall forfeit all rights in submitting a proposal and will not be considered for award.

No one person can represent more than one Proposer and each Proposer shall not have more than five (5) persons in attendance. Any Proposal received from a firm not represented at this conference and site tour shall be returned unopened. The conference will begin promptly at 09:00 a.m., those seeking admittance after 9:10 a.m. will not be admitted. The site tour will follow immediately thereafter.

Directions to the conference and site tour are as follows:

1. Take Southbound Powhite Parkway across the James River Bridge and get in the second to right lane
2. Stay on Southbound Powhite Parkway past the Forest Hill Avenue exit. You should now be in the right lane
3. At the Express/Cash split, stay in the right lane and go towards Cash
4. In approximately 3/4 of a mile, turn into the Powhite South Administrative Building driveway on your right (immediately in front of the Toll Plaza)

RMTA will provide transportation from the conference to each tolling location on this site tour and back to the conference location.

3.1.2. Additional Pre-Proposal Site Tour:

All Proposers will be allowed an opportunity to further inspect the existing toll collection system on the day following the Mandatory Pre-Proposal Conference/Site Tour described above. Proposers are not required to participate in this day of the site tour.

Attendees shall be at RMTA's Powhite South Administrative Building (directions above) at or before 9:00 a.m. local time to participate in this optional site tour. RMTA will provide transportation from the administration building to each tolling location on this site tour and back to the administration building.

3.2. Submission Coordinator:

The Submissions Coordinator for this procurement is:

> Paula Watson, Submissions Coordinator
> RE: RFP NO. TSS – 2017
> 919 E Main Street, Suite 600
> Richmond, VA 23219
> 804.523.3308
> Email: Paula.Watson@rmtaonline.org

3.3. Terms of Discussion:

All Proposers are required to fill out Exhibit I: Terms Of Discussion Form (included as part of this RFP) and provide an appropriately signed copy of this filled out form to the Submissions Coordinator on or before the due date/time identified in the Schedule of Events (section 4 below).

Such due date/time shall also represent the end of the comment period regarding the procurement process or timeline. Failure to submit this form as required will result in the Proposer being removed from further consideration for this project.

3.4. ORT Pavement and Gantry Statement

All Proposers are required to fill out Exhibit J: ORT Pavement and Gantry Statement Form (included as part of this RFP) and provide an appropriately signed copy of this filled out form to the Submissions Coordinator on or before the due date/time identified in the Schedule of Events (section 4 below). Failure to submit this form as required will result in the Proposer being removed from further consideration for this project.

3.5. Proposer Inquiries:

Additional information inquiries regarding specifications that are part of this RFP and questions regarding submission of Proposals must be submitted in writing as described below. The due date/time for these inquiries and questions is identified in the Schedule of Events (section 4 below).

Proposers shall submit all inquiries and questions in accordance with the Schedule of Events, via email, to the Submission Coordinator's email address. Proposers shall provide all inquiries and questions using a completed Proposer Inquiry Form (form PI-1, provided as Exhibit I of this RFP) attached to an e-mail. The subject line of each such email shall include the firm name of the Proposer and the Proposer Inquiry number. Proposer inquiries shall be sequential; for example, the first such email submittal from a Proposer will be Proposer Inquiry #1, the second such email from that Proposer will be Proposer Inquiry #2, and so on. Proposers are encouraged to submit their questions and inquiries, or portions of their questions and inquiries, early.

The Authority will provide acknowledgement of emails that have been received. Responses to Proposer inquiries and questions will be consolidated and made available to all Proposers as an addendum as described in the Schedule of Events (section 4 below).

It is the responsibility of the Proposer to ensure that an acknowledgement of the inquiry or question is received from the Authority and a subsequent response is provided by the Authority.

3.6. RFP Addenda:

The Authority reserves the right to issue addenda to this RFP in writing at any time and for any purpose, without limitation. All addenda to this RFP will be posted on the Authority's website, www.rmtaonline.org.

3.7. Proposal Submission:

All Proposals must be submitted to the Authority prior to the date and time stipulated in the Schedule of Events (section 4 below) and in accordance with Proposal Submission, Deadline, Location and Quantity instructions and requirements set forth in section 6 below.

The Authority reserves the right to waive any informality in the Proposal format and minor irregularities. No other arrangement or distribution of the Proposal information shall be made by the Proposer. Failure on the part of the Proposer to respond to specific requirements detailed in the RFP may be the basis for disqualification of the Proposal.

3.8. Evaluation Committee:

A committee has been appointed by the Authority to evaluate Proposals ("Evaluation Committee") as further detailed herein. In addition to the rights described elsewhere in these instructions, the Authority reserves the right to:

- Consider any source of information in evaluating Proposals
- Omit any planned evaluation step if, in the Authority's view, the step is not needed
- At its sole discretion, reject any and all Proposals at any time

Proposers shall not make any contact whatsoever with any member of the Evaluation Committee from the issuance of the RFP until after the RMTA Board approves contract award.

Proposers shall not in any way cause or encourage others to make such contact. Violation may result in the respective Proposal being rejected and/or the Proposal being disqualified from further consideration under this RFP.

3.9. Appeals & Protests

Proposers may agree to, comment on, appeal or protest the procurement process and timeline described herein. All such comments, appeals and protests shall first be made to:

>Paula Watson, Internal Auditor & Director of Procurement
>RE: RFP NO. TSS – 2017
>919 E Main Street
>Suite 600
>Richmond, VA 23219
>Email: Paula.Watson@rmtaonline.org

The deadline for all such appeals and protests shall be the same as the deadline for submitting a Terms of Discussion Form as identified in the Schedule of Events (section 4 below).

4. SCHEDULE OF EVENTS

The following table provides the anticipated Schedule of Events for this RFP through Notice to Proceed. This schedule is subject to change at the Authority's discretion and the Authority will notify Proposers of such changes as it deems appropriate.

EVENT	RFP REFERENCE	DATE	LOCAL TIME
RFP advertisement		03/24/17	
Mandatory pre-proposal conference	Section 3.1.1	04/06/17	9:00 a.m.
Additional site tour	Section 3.1.2	04/07/17	9:00 a.m.
Terms of Discussion Form due	Section 3.3	04/14/17	1:00 p.m.
ORT Pavement and Gantry Statement Form due	Section 3.4	04/14/17	1:00 p.m.
Proposer inquiries due	Section 3.5	04/14/17	1:00 p.m.
Authority issues addendum providing responses to Proposer Inquiries		Anticipated by 04/30/17	
Proposals due	Section 3.7	06/21/17	1:00 p.m.
Oral interviews	Section 9	08/09/17	Various
Notice to proceed	Section 13	09/27/17	

5. PROJECT MILESTONES

The following table provides the key schedule milestones for the implementation aspects of the Contract after Notice to Proceed assuming the base work is awarded.

Milestone	DATE*
Notice To Proceed	September 27, 2017
Revenue Service Acceptance Test	September 27, 2019

*Note: The dates are estimated here for the purpose of developing standard schedules across Offerors' responses. The contract will start at an agreed upon date once approved by RMTA and the selected Offeror. Dates on subsequent milestone will be determined based on the Proposer's schedule and finalized upon RMTA approval of the Baseline Schedule Agreement which along with all subsequent milestones are further detailed in TS-01.

6. FORM OF PROPOSAL

Proposers shall use the standard format defined below in their proposal. This format addresses required areas and enables the Authority to modify the scope of work to meet its needs.

Proposals shall be delivered to the Authority in two distinct parts
- Technical Proposal
- Price Proposal (for Base Work and Extra Work as defined)

These distinct parts are further detailed in section 6.1 below:

6.1. Proposal Submission, Deadline, Location and Quantity Instructions

Proposals submitted in response to this RFP must be received by the Authority no later than the time and date specified in the Schedule of Events above. Proposals must be addressed to the Submissions Coordinator identified in section 3.2 above.

Packages containing Proposals must be clearly marked as follows:

RESPONSE TO RFP NO. TSS – 2017
Toll System & Services Contract

Delivery of the Proposals shall be at the Proposer's expense. Proposers mailing Proposals should allow sufficient time for mail delivery to ensure timely arrival. The Authority cannot waive or excuse late receipt of a Proposal which is delayed and late for any reason. Any Proposal received after the due date and time in the Schedule of Events will remain unopened and be removed from further consideration.

All Proposals will be dated and time stamped by the Authority to verify official time and date of receipt. The time of receipt shall be considered to be the time when a Proposal has been officially documented by the Authority, in accordance with its established policies, as having been received at the location designated above. The

Authority accepts no responsibility for mislabeled mail. Any and all damage that may occur due to shipping shall be the Proposer's responsibility.

The Proposal Package shall include:

- **Technical Proposal:** One (1) single sided, readily reproducible paper copy of all Technical Proposal items identified in section 6.4 below marked "ORIGINAL", one (1) compact disc with electronic copies of same and ten (10) fully assembled, double-sided paper copies of same. All such copies shall contain the exact same information and any differences between copies may result in the Proposal being removed from further consideration. The electronic copy of each document shall be provided in searchable .pdf format and an additional electronic copy of certain documents shall be provided in other formats as specified in section 6.4 below.

- **Price Proposal:** A separately sealed envelope as described in section 6.5 below containing one (1) single sided, readily reproducible paper copy of all Price Proposal items identified there and marked "ORIGINAL", one (1) compact disc as described in section 6.5 with electronic copies of same and ten (10) separately bound, fully assembled, double-sided paper copies of same. All such copies shall contain the exact same information and any differences between copies may result in the Proposal being removed from further consideration.

Proposers are permitted to submit only one (1) Proposal in response to this RFP. A Proposer's disclosure or distribution of its Proposal other than to the Authority will be grounds for disqualification.

6.2. Proposal Format

Proposals shall follow the following format:

- Proposal shall be provided in a three-ring binder
- Proposal shall be printed on white paper with dimensions of 8.5 (eight and a half) by 11 (eleven) inches with right and left margins of one (1) inch
- Proposal shall use Times New Roman font with a size of eleven (11)
- Exceptions for paper and font sizes are permissible for: Graphical exhibits, which may be printed on white paper with dimensions of 11 (eleven) by 17 (seventeen) inches; and material in appendices, including schedules and organization charts
- Each page of a Proposal shall include a page number and the number of total pages and identification of the Proposer in the page footer. Each page shall be numbered consecutively within each section (i.e., 1-1, 1-2…; 2-1, 2-2…; 3-1, 3-2…, etc.), and the page numbers shall be centered at the bottom of each page
- Proposal shall be printed double-sided (except for the one marked "ORIGINAL")
- Tabs shall separate each Section of the Proposal

6.3. Proposal Page Limit

Proposals shall be limited to 200 (two hundred) page-sides (i.e. 100 (one hundred) sheets when printed double-sided or 200 (two hundred) sheets when printed single-sided), excluding the items identified in the table below as not applying to the page limit. As identified and limited within the instructions for each section of the Proposal provided below, specific sections may include graphical depictions, charts and schedules on 11 (eleven) x 17 (seventeen) inch folded pullouts. Proposals shall adhere to the outline and applicability of page limits below.

Technical Proposal Page Limit Applicability

Section	Page Limit Applies? (Y/N)
Cover	No
Transmittal Form Letter	No
Table of Contents	No
Section 1: Executive Summary	Yes
Section 2: Glossary of Terms & Abbreviations	Yes
Section 3: Requirements Compliance Matrix	No*
Section 4: Approach to Scope of Work	Yes
Section 5: Corporate Qualification and Demonstrated Experience (Forms within this section are included in the page count)	Yes
Section 6: Contract Exceptions	No
Section 7: Other Forms & Information	No
Section 8: Project Organization and Key Staff Qualifications (Forms within this section are included in the page count)	No**
Attachment A: Bill of Materials	No
Attachment B: Product Cut Sheets	No
Attachment C: Detailed Preliminary Schedule (optional location)	No

* The submission of the Requirements Compliance Matrix (RCM) shall use the Excel spreadsheet provided. The font and style of the RCM is exempt from the submission requirements; however, for legibility reasons, the font may not be reduced further from the file provided.

** Resumes for Key Staff shall not exceed four (4) page-sides each and all other staff shall not exceed two (2) page-sides each.

Price Proposal Envelope Page Limit Applicability

Section	Page Limit Applies? (Y/N)
Base Work Price Proposal	No*
Proposal Guarantee	No
Contract Bond Form	No
Extra Work Price Proposal	No

* The submission of the Price Proposal shall use the Excel spreadsheet provided. The font and style of the Price Proposal is exempt from the submission requirements; however, for legibility reasons, the font may not be reduced further from the file provided.

6.4. Technical Proposal Package

The Technical Proposal Package shall contain the following and be organized in accordance with the order listed below. All paper copies of the Proposal must provide a tabbed divider between each section.

Cover Page:

The first page of the Proposer's Technical Proposal must be a cover page containing the following text:

> RESPONSE TO RMTA RFP NO. TSS – 2017
> Toll System & Services Contract

Transmittal Form Letter:

The Proposer's Technical Proposal must include a complete and duly executed Proposal Transmittal Letter using the form provided as Exhibit A. One (1) copy of the Proposal Transmittal Letter shall be signed by an official authorized to legally bind the Proposer and shall be marked "ORIGINAL."

Section 1 - Executive Summary:

The Proposer's Technical Proposal must include an overview of the entire Proposal describing the most important elements of the Proposal. Include the high-level qualifications and experience of the Proposer and discuss key areas where the Proposal exceeds the requirements of the RFP.

Section 2 - Glossary of Terms and Abbreviations:

The Proposer's Technical Proposal must include a glossary of abbreviations and define key terms used for proposal evaluators.

Section 3 - Corporate Qualifications and Demonstrated Experience:

The Proposer's Technical Proposal must include the following forms, and only the following forms, in this section.

Using the form provided in Exhibit C (Vendor and Subcontractor Information Statement), the Proposer shall provide the requested information for their firm and all subcontractors, using additional pages as necessary to cover all subcontractors.

Using the form provided in Exhibit D (Vendor Referenced Projects), the Proposer shall describe their experience with projects providing the minimum qualifications required in section 2 above. Experience with ORT, cash, automatic coin machines and electronic toll collection environments; the implementation of violations enforcement systems; E-ZPass / IAG implementation, and toll system maintenance should be reflected. Proposers shall provide quantity, dates and client names (preferably 3 different clients) for the last three deliveries of 10 units or more of the automated coin machines being proposed.

Using the form provided in Exhibit E (Vendor Past Performance), the Proposer shall detail any litigation, claims, dispute proceedings and arbitration related the execution of

any past or current contract for the development, implementation, installation or maintenance of a toll system or any portion thereof.

Section 4 – Requirements Compliance Matrix:

The Proposer's Technical Proposal must include a Requirements Compliance Matrix, which demonstrates how the Proposer meets requirements outlined in the RFP. Section 3 shall contain only the completed RCM, provided in Exhibit B.

Section 5 - Approach to Scope of Work:

The Proposer's Technical Proposal must describe the technical approach to the Project and how the Proposer will plan for and accommodate each aspect of the Scope of Work. The information requested in the following types of tables, located throughout Tolling Specifications #01 through #06, must be included in this description.

	Proposal Criteria

Within this section, RMTA requires that all Proposal Criteria be addressed by the Proposer using numbered sections corresponding to those in each Tolling Specification. The Proposer's response in this section may include references to content found in other sections of the proposal.

- TS 01 Project Management, Documentation, Design and Test Services
- TS 02 Operations & Maintenance Work
- TS 03 Hardware and Installation
- TS 04 Host Subsystem
- TS 05 ORT Zone Subsystem
- TS 06 Traditional Lane Subsystem

Section 6 - Corporate Qualifications and Demonstrated Experience:

The Proposer's Technical Proposal must include the following forms, and only the following forms, in this section.

Using the form provided in Exhibit C (Vendor and Subcontractor Information Statement), the Proposer shall provide the requested information for their firm and all subcontractors, using additional pages as necessary to cover all subcontractors.

Using the form provided in Exhibit D (Vendor Referenced Projects), the Proposer shall describe their experience with projects providing the minimum qualifications required in section 2 above. Experience with ORT, cash, automatic coin machines and electronic toll collection environments; the implementation of violations enforcement systems; E-ZPass / IAG implementation, and toll system maintenance should be reflected.

Using the form provided in Exhibit E (Vendor Past Performance), the Proposer shall detail any litigation, claims, dispute proceedings and arbitration related the execution of

any past or current contract for the development, implementation, installation or maintenance of a toll system or any portion thereof.

Section 7 - Contract Exceptions:

The Proposer's Technical Proposal must detail, in this section, any and all exceptions and alterations, and provide specific proposed alternative language in each case, to the Contract necessary or required by the Proposer to perform the Scope of Work at the prices proposed. It is not the intent of the Authority to entertain any additional exceptions and alterations after the Proposal due date/time.

Any Proposer making execution of the Contract contingent upon exceptions or alterations not identified in this section of their Proposal shall forfeit the Proposal Guarantee provided by said Proposer, as described in section 6.5 below, such that the Proposal Guarantee becomes the property of the Authority.

Section 8 - Other Forms & Information:

The following forms shall be completed and included in this section in the following order as in Proposer's Technical Proposal:

Exhibit I: Authority Bid Forms
- Non-Collusion Affidavit (NC-1)
- Receipt of Addenda (RA-1)

Attachment A: Product Cut Sheets:
If available, provide cut sheets for all off-the-shelf equipment and products that are included as part of the System proposed.

6.5. Price Proposal

In an envelope clearly marked "Price Proposal", the Proposer shall provide the following:

Price Sheets:

Within the Price Proposal envelope, the Proposer shall provide a detailed price proposal using the sheets/forms provided with this RFP as Exhibits G: Price Proposal Instructions and Forms. In addition to the electronic copy in searchable .pdf format, the Proposer shall provide an electronic copy of this detailed price proposal in .xls format on a compact disc provided within the same Price Proposal envelope.

Price Sheets Attachment: Bill of Materials:

Within the Price Proposal envelope, the Proposer shall provide a costed preliminary Bill of Materials (BOM) in the Proposer's standard form as an attachment. Please note that the cost information provided in this BOM applies for the Extra Work Parts Inventory and Extra Work described in Tolling Specification #02.

Proposal Guarantee:

The Proposer shall provide a CASHIER'S CHECK, CERTIFIED CHECK or PROPOSAL BOND in favor of the Richmond Metropolitan Transportation Authority for an amount equal to five (5) percent of the total amount in the Price Proposal or $2,000.00, whichever is the greater. Any such Proposal Bond shall be of the form in Exhibit I (PB-1) and binding upon a

surety company or companies as are approved by the Commonwealth of Virginia; are duly authorized to issue surety in Virginia; and whose name appears on the current list of the Treasury Department of the United States as acceptable as surety upon federal contracts.

Such proposal guarantee shall be submitted with the understanding that it shall guarantee that the Proposer will not withdraw such Proposal during the period of 120 days following the Proposal due date in the Schedule of Events; that if such Proposal is accepted, the Proposer will accept and perform under the terms of the Request for Proposal and enter into the Agreement and provide an executed Payment and Performance Bond and evidence of insurance to RMTA within ten (10) days after award by RMTA, or such greater period of time as may be allowed by the Authority in the Authority's sole discretion.

In case a Proposer is selected by the Authority and fails to enter into an Agreement or fails to furnish both a Payment and Performance Bond and evidence of insurance as described in the Contract and acceptable to the Authority within ten (10) days of award, then the CASHIER'S CHECK, CERTIFIED CHECK, or PROPOSAL BOND provided by said Proposer shall become the property of the Authority and shall be deposited or drawn upon, as applicable, to the credit of the Authority.

This surety shall be returned to all Proposers not selected by the Authority without interest after the Contract is fully executed or 120 days after the Proposal due date, whichever comes first.

7. PROPOSAL INVENTORY

The Submission Coordinator will examine each Proposal package to determine completeness of each Proposal package and if the two (2) previously described, separately sealed and appropriately marked Price Proposal envelopes were provided. Any Proposal received without these separately sealed Price Proposal envelopes will be removed from further consideration. The Authority reserves the right to also reject any Proposals that have not been submitted sufficiently complete per the Authority's requirements for the Proposal package contents.

The Submission Coordinator will verify that the Proposer previously:
- Attended the Mandatory Pre-Proposal Conference/Site Tour (section 3.1 above)
- Submitted the:
    - o Terms of Discussion Form, as prescribed in section 3.3 above
    - o ORT Pavement and Gantry Statement Form, as prescribed in section 3.4 above

The Proposal submitted by any Proposer not meeting these requirements will similarly be removed from further consideration.

8. TECHNICAL PROPOSAL SCORING

All Technical Proposals for base and extra work and their respective Price Proposals envelopes, except those removed from further consideration as described above, will be distributed to the Evaluation Committee so that its members may study, discuss and assess the attributes of each.

9. ORAL INTERVIEW

All Proposers, except those whose Proposal was removed from further consideration as described above, are required to physically attend and participate in an oral interview at the Authority's offices as shown in the Schedule of Events at a day and time assigned by the Authority. Such attendance and participation shall be at the sole expense of the Proposer.

The oral interview:
- Provides an opportunity for the Proposer to clarify or elaborate on the Proposal
- Allows the Evaluation Committee to ask questions regarding the Proposer's entire Proposal as well as questions related to due diligence performed by the Authority or their designee(s)
- Ensures that the Evaluation Committee has a full understanding of the proposed system and services, any exceptions or required changes to the Contract and the Price Proposal
- Provides a means for the Evaluation Committee and Proposer to discuss the Price Proposal and the Contract exceptions previously stated in writing by the Proposer

The Proposal of any Proposer unwilling or unable to attend and participate in an Oral Interview will be removed from further consideration.

10. SHORT LIST

From assessing written Technical and Price Proposals and conducting oral interviews as described above, the Evaluation Committee will determine, by consensus, two or more Proposers determined to be fully qualified, responsible and suitable with whom the Authority will conduct negotiations (the "Short List"). The Proposal of any Proposer not on the Short List will be removed from further consideration and the associated Proposal Guarantee returned.

In accordance with §2.2-4301 of the Virginia Public Procurement Act, should the Authority determine in writing and in its sole discretion that one Proposer is clearly more highly qualified than the others under consideration, the Authority may solely negotiate and award the contract to that Proposer, subject to and as described below in "Contract Finalization and Execution; Board Consideration."

In determining the Short List, the Authority will evaluate the proposals based on the following criteria, in order of importance. The overall quality of the Proposals submitted and subsequent interviews will be representative of the Proposers abilities and taken into account during evaluations.

1. Toll System Design and Technical Approach
2. Ability to Execute and Meet the Project Schedule
3. System Maintenance & Warranty Approach
4. Proposer Qualifications
5. Project Organization and Key Staff Qualifications

The following parts outline the key criteria upon which evaluations will be based.

10.1.   Toll System Design and Technical Approach

In this area of focus, the Authority will use a number of considerations and criteria including but not limited to the following:

a) <u>Design of the System to meet the specified requirements</u>: including the documentation of the proposed System design and approach to Work; demonstration of a logical and thorough approach to design and development; and thoroughness in addressing System requirements.   The use of open standards, architecture as well as ability to accommodate horizontal/vertical scalability. Flexibility of the proposed Solution (both hardware and software) with regard to the Authority's right to use and operate after the conclusion of the Contract. And evidence of willingness to exceed Project requirements.

b) <u>Transactional and financial tracking, reporting and reconciliation</u>: Representation of capability to efficiently design, develop, test, and implement a flexible, reliable and auditable System that addresses the Authority's tracking, reporting and reconciliation requirements; and further, that the proposed System will be easy to use and administer by the Authority and its operations and finance staff.

c) <u>Innovation in the design, integration, and use of equipment</u>: Innovation is defined as providing a robust system that is scalable / expandable / flexible to accommodate future changes based on changes in lane configurations, back office processing, national interoperability requirements, violation enforcement technologies, the addition of new sub-systems and locations and maximizes the ability to interface with external systems. Innovation can also be demonstrated through unique approaches with tested results illustrating operational cost savings and reduction in capital costs. An Offeror who can provide a system that is modular and scalable and would allow RMTA to integrate new technologies and allows for conversion of lane modes from ACM to E-ZPass only without the need for significant changes is preferred. Also an Offeror whose approach provides RMTA the ability to maximize re-use of components of the proposed solution for future upgrades, including the same software code-base, to support a migration to a future AET solution inclusive of the elimination of traditional toll plazas/booths and the introduction of enhancements to the host for items such as ALPR and pay-by-plate functionality is preferred.

d) <u>System Performance and Reliability:</u> Proposed system performance and actual documented performance of installed systems on similar projects; and where applicable, use of components and systems proven in operations on other projects.

e) <u>Ability to Coordinate Effectively with Other Contractors:</u> Offeror will need to perform in a multi-solution, multi-contractor environment such as the Authority environment and to cooperate with other contractors in the development and implementation of necessary system interfaces

f) Price Proposal

g) Exceptions and requested changes to the Contract

10.2. Ability to Execute and Meet the Project Schedule

In this area of focus, the Authority will use a number of considerations and criteria including but not limited to the following:

a) Representation of ability to effectively and successfully meet or exceed the scheduling requirements of the Project taking into consideration potential risks and/or efficiencies.
b) Demonstration of flexibility in working with civil contractors and existing toll system providers.
c) Provisions for maximizing safety for the project while limiting disruptions to the traveling public.
d) Representation of project management approach that addresses the program requirements including such aspects as:
   1. Logic, clarity and specificity of work plan.
   2. Representation of a plan for coordination with CSC/VPC, the current system provider and the Authority.
   3. Organization, logic, quality and appropriateness of labor distribution relative to scope of work.
e) Demonstration of a logical approach to Project phasing, testing and transition.
f) Demonstration of an effective approach to Quality Assurance and Quality Control.

10.3. System Maintenance & Warranty Approach

In this area of focus, the Authority will use a number of considerations and criteria including but not limited to the following:

a) Demonstration of ability to meet or exceed maintenance services and warranty requirements as specified in the Tolling Specifications documents.
b) Demonstration of innovation in the Proposer's approach to maintenance will be evaluated, here innovation means providing materials, operating efficiencies and equipment that will reduce the long-term operating and maintenance expenses of the System and enhance System performance and equipment component life. The evaluation will consider innovative and thoughtful approaches on how to provide efficient and productive operational maintenance on the System.
c) Demonstrated serviceability of components and the overall System, where serviceability addresses the ease with which System maintenance personnel can remove, replace and repair components without affecting traffic.
d) Maintenance Coordination – Understanding and ability to coordinate and work with other vendors and contractors in supporting maintenance services.
e) External Interface Coordination – Understanding and ability to support and coordinate with external entities such as the CSC/VPC operator(s).
f) Ability and approach to accommodate end of term transition of maintenance services to another provider and/or the Authority itself.
g) Provisions allowing the Authority and the Contractor to effectively and reliably monitor and maintain the System.

10.4.   Proposer Qualifications

In this area of focus, the Authority will use a number of considerations and criteria including but not limited to the following:

a) Evidence of Proposer and its Equity Members have the financial capability to carry out the Project responsibilities potentially allocated to it as demonstrated by the Tolling Specifications. And "Equity Member" means (i) each entity with a direct equity interest in Proposer (whether as a member, partner, shareholder, joint venture member or otherwise) and (ii) each entity proposed to have a direct equity interest in Proposer. The evaluation will take into account the following considerations both currently as well as over the last three (3) years, as appropriate:
   a. Profitability
   b. Capital structure
   c. Ability to service existing debt
   d. Ability to invest equity
   e. Other commitments and contingencies
b) Proposer shall provide letter(s) from a surety or insurance company or companies stating that the Proposer is capable of obtaining 100% performance bonds and payment bonds for $25 million. In the case of a joint venture, multiple letters may be provided for members who will be jointly and severally liable for the work. Letters indicating "unlimited" bonding capability are not acceptable. The surety or insurance company or companies providing such letter(s) must be licensed as a surety or sureties and qualified to do business in the Commonwealth of Virginia. They must also be listed in the current edition of US Department of Treasury, Fiscal Service – Circular 570, *Companies Holding Certificates of Authority as Acceptable Sureties of Federal Bonds and as Acceptable Reinsuring Companies.*
c) The Proposer nor any other entity, in the case of a joint venture, is currently disqualified, removed, debarred or suspended from performing or bidding on work for the federal government or any state government.
d) Evidence of meeting the minimum qualifications specified above (Section 2) and description of other related experience.
e) Proposers shall have a fully functional and multi-configurable test track facility within the US at the time the Proposal is submitted to the Authority for evaluation and scoring.
f) Content of the completed reference forms and results of any follow-up on referenced projects.

10.5.   Project Organization and Key Staff Qualifications

In this area of focus, the Authority will use a number of considerations and criteria including but not limited to the following:

a) Project organization, qualifications, time commitment and local presence of Key Staff.
b) Demonstrated relevant experience of the project manager, task managers and other Key Staff.
c) Evidence of Key Staff in similar roles in example projects.
d) References based on reference forms and subsequent follow-up by the Authority.
e) Experience, technical competence and role of subcontractors.

11. NEGOTIATIONS AND EVALUATIONS

Shortlisted Proposers are required to physically attend and participate in negotiations at the Authority's offices as shown in the Schedule of Events at a day and time assigned by the Authority. The Authority, at its sole discretion, may alternatively require such participation via electronic means. Any such attendance and participation shall be at the sole expense of the Proposer.

The Proposal of any Shortlisted Proposer unwilling or unable to attend and participate in negotiations as described above will be removed from further consideration. At the conclusion of negotiations, the Proposers(s) may be asked to submit a best and final offer in writing. After submission of a best and final offer, no further negotiations shall be conducted with the Proposer(s).

The Authority shall select the Proposal which, in its opinion, provides the overall best value to the Authority, which shall mean the overall combination of quality, price, and various elements of required services that are optimal relative to RMTA's needs and award the Contract to that Proposer, subject to and as described in Section 12 below with quality being considered an important factor along with other criteria described in Section 10 above and including any best and final offer, in determining which Proposal offers the overall best value to RMTA. Price shall be considered, but need not be the sole determining factor.

12. CONTRACT FINALIZATION, BOARD CONSIDERATION & EXECUTION

Based on the foregoing, the Authority may in its sole discretion, prepare and submit to the selected Proposer the Contract as finally negotiated.

If such Proposer accepts the Contract as finally negotiated, a corresponding recommendation to award the resulting Contract will be submitted to the Authority's Board for approval and signatory authority to execute the resulting Contract.

If the Proposer does not accept the Contract as finally negotiated, and the Authority in its sole discretion determined that it cannot reach a final Contract with the Proposer selected as aforesaid, the Authority shall so notify such Proposer; cease efforts to finalize the Contract there; and begin similar efforts with the Proposer next highest. The Authority will repeat these steps as necessary with each next highest Proposer to achieve final Contract.

The Authority's Board will consider the award of the Contract to the successful Proposer and grant signatory authority for execution of the resulting Contract.

Once all necessary contractual instruments are in place, the Authority will notify the successful Proposer and forward the final agreement resulting from Contract Finalization for execution. After receipt of the Contract Bond and evidence of insurance and subsequent execution of the Agreement by the Authority, one fully executed copy of the Agreement will be supplied to the successful Proposer (the "Contractor" once the agreement is in force).

13. ADDITIONAL TERMS AND CONDITIONS

The Authority anticipates issuing a Notice To Proceed only concurrent with or after the full execution of the Contract. Proposers shall not incur liabilities or costs for the Authority's benefit prior to receiving such Notice To Proceed.

14. ADDITIONAL PROCUREMENT TERMS AND CONDITIONS

By signing and submitting its Proposal, the successful Proposer agrees to be bound by all the terms contained in this RFP, and by all of the terms and conditions of any resulting contract(s) which may be awarded.

14.1.   Public Record

Ownership of all data, materials, and documentation originated and prepared for RMTA shall belong exclusively to RMTA and be subject to public inspection in accordance with the Virginia Freedom of Information Act (VFOIA). Trade secrets or proprietary information submitted by a Proposer shall not be subject to disclosure under VFOIA; however the Proposer must invoke the protections of §2.2-4342F, in writing, either before or at the time of Proposal submission. The written notice must clearly and distinctly identify the data or materials to be protected and state the reasons why protection is necessary. The classification of an entire Proposal document, line item prices, or total proposal prices as proprietary or trade secrets is not acceptable and will result in rejection of the Proposal.

14.2.   Oral Statements and Commitments

The Proposer must clearly understand that any verbal representation made or assumed to be made during any oral discussion held between Proposer's representatives and any Authority personnel is not binding. Only the information issued in writing by the Authority and added to this Request for Proposal by the Authority through an official written addendum is binding.

14.3.   Mandatory Requirements

Any specification or statement containing the word "must", "shall", or "will" is a requirement. All Proposers shall be required to complete and submit the Requirements Compliance Matrix, included in Exhibit B which covers all requirements in connection with this RFP. If the Proposer does not comply with any requirement(s) of Tolling Specifications, the specific requirement(s) to which exception is taken must be identified on the RCM and briefly explained in the comments column.

14.4.   Familiarity of Job Requirements

The Proposer's signature on the solicitation response constitutes certification that the Proposer is familiar with the job requirements, site, and security requirements and is aware of the conditions under which the work must be accomplished. RMTA will not consider any vendor claims as a result of the unknown conditions.

14.5.   Incurring Costs

Neither the Authority nor any of its employees, officers, members, engineers, consultants, attorneys, or agents shall be held liable for any expenses incurred by any Proposer responding to

this RFP for expenses to prepare the Proposal, deliver the Proposal, or to attend any mandatory conference, site tour, oral presentation, interview, negotiation or other meeting.

14.6.   Economy of Preparation

Proposals should be prepared simply and economically, providing a straightforward, concise description of Proposer's abilities to satisfy the requirements of the RFP. Emphasis should be placed on completeness and clarity of content.

14.7.   Labeling of RFP Sections

The sections within this RFP contain instructions governing how the Proposer's Proposal is to be arranged, submitted and to identify the material to be included therein.

14.8.   RFP Status

The issuance of this RFP constitutes only an invitation to submit a Proposal. RMTA reserves the right to determine, in its sole discretion, whether any aspect of a Proposal satisfactorily meets the criteria established in this RFP, the right to seek additional information and/or clarification from any Proposer, the right to negotiate with any Proposer submitting a response, and the right to award all, in part, or reject any or all responses with or without cause. In the event that the RFP is withdrawn by RMTA for any reason, including but not limited to the failure to occur of any of those things or events set forth herein, RMTA shall have no liability to any Proposer for any costs or expenses incurred in connection with this RFP or otherwise.

14.9.   Price Quotations

See Exhibits G for pricing quotation requirements.

14.10.   Independent Price Determination

A Proposal will not be considered for award if the prices in the Proposal were not arrived at independently without collusion, consultation, communication or agreement as to any matter relating to prices with any competitor. Refer to Exhibit I: Authority Forms, specifically the Non-Collusion Form (NC-1).

14.11.   Tax Exempt Financed

RMTA has financed the major portion of its expressway facilities, and may finance the particular project, with tax-exempt obligations. Regulations and procedures of the U.S. Treasury that apply to these obligations (and the financed facilities) require, among other things, that contracts pertaining to the use, operation and management of such facilities meet certain requirements, including the method of compensation. For example, compensation may not be based in whole or in part on net profits of the financed facility. Other requirements pertain to the term (including renewal terms) of the contract. In all cases, the applicable provisions of the Agreement must satisfy applicable Treasury Regulations.

14.12.   Qualifications of Proposers

RMTA may make such reasonable investigations as deemed proper and necessary to determine the ability of the Proposer to perform the services and the Proposer shall furnish to RMTA all such information and data for this purpose as may be requested. RMTA reserves the right to inspect Proposer's physical facilities prior to award to satisfy questions regarding its capabilities. RMTA

further reserves the right to reject any proposal if the evidence submitted by, or investigations of, such Proposer fails to satisfy RMTA that such Proposer is properly qualified to carry out the Agreement and to provide the services and/or furnish the goods contemplated therein.

14.13.   Proposal Valid Period

The Proposer's Proposal and pricing shall be effective for a period of 180 days or until the effective date of the resulting contract, whichever comes first.

14.14.   Withdrawal of Proposals

No Proposal shall be withdrawn, except with the consent of RMTA, for a period of one hundred and twenty (120) calendar days following the due date of the proposals. At any time prior to the due date for submitting Proposals, a Proposer may withdraw its Proposal by written notice, facsimile, email, telegram or in person by the respondent or an authorized representative.

Proposals cannot be withdrawn after the due date without forfeiture of the Proposal Guarantee unless said consent is received from the Authority in advance.

14.15.   Rejection of Proposals

The Authority shall select the Proposal whose terms will be most advantageous to RMTA based upon the criteria set forth in this RFP, but the Authority reserves the right to accept or reject any or all Proposals, in part or in whole at its discretion. The Authority reserves the right to withdraw this RFP at any time and for any reason. Submission of, or receipt by the Authority of Proposals confers no rights upon the Proposers nor obligates the Authority in any manner.

A contract based on this RFP and a Proposer's Proposal may or may not be awarded. Any contract resulting in an award from this RFP is not valid until properly approved and executed by the Authority.

14.16.   Contractor Preferences MBE/WBE

The Authority strongly encourages minority owned and women owned businesses to submit Proposals.

14.17.   Nondiscrimination

The Authority shall not discriminate against any Proposer in the solicitation or award of this contract because of race, religion, color, sex, national origin, age, disability, faith-based organizational status, any other basis prohibited by state law relating to discrimination in employment.

The Proposer further agrees to comply with the Civil Rights Act of 1964 and all other applicable federal, state and local laws and regulations.

14.18.   Faith-Based Organizations

The Richmond Metropolitan Transportation Authority does not discriminate against faith-based organizations as that term is defined in the Virginia Public Procurement Act Section 2.2-4343.1.

14.19. Conflict of Interest

Proposer affirms that it, its officers or members or employees at present have no interest and shall not acquire any interest, direct or indirect, which would conflict or compromise in any manner or degree with the performance or its services hereunder. The Proposer further covenants that in the performance of the contract, the Proposer shall periodically inquire of its officers, members and employees concerning such interests. Any such interests discovered shall be promptly presented in detail to the Authority.

14.20. Prohibition Against Gratuities

Proposer warrants that it has not employed any company or person other than a bona fide employee working solely for the Proposer or a company regularly employed as its marketing agent to solicit or secure the contract and that it has not paid or agreed to pay any company or person any fee, commission, percentage, brokerage fee, gifts or any other consideration contingent upon or resulting from the award of the contract.

For breach or violation of this warranty, the Authority shall have the right to annul the RFP award and the resulting contract without liability at its discretion or to pursue any other remedies available under this contract or by law.

14.21. Ethics in Public Contracting

By submitting a RFP, all Proposers certify that their responses are made without collusion or fraud and that they have not offered or received any kickbacks or inducements from any other proposer, supplier, contractor or subcontractor in connection with their RFP submission, and that they have not conferred on any public employee having official responsibility for this procurement transaction any payment, loan, subscription, advance, deposit of money, services or anything of more than nominal value, present or promised unless consideration of substantially equal or greater value was exchanged

14.22. Immigration Reform and Control Act of 1986

By submitting its proposal, Proposers certify that they do not and will not during the performance of this contract employ illegal alien workers or otherwise violate the provisions of the federal Immigration Reform and Control Act of 1986.

14.23. Announcement of Award

Upon the award or the announcement of the decision to award a contract as a result of this solicitation, RMTA will publicly post such notice by publication on RMTA's website, www.rmtaonline.org.

Exhibit A: Proposal Transmittal Letter

PROPOSAL TRANSMITTAL LETTER

Company Name_____

Address_____

To: The Richmond Metropolitan Transportation Authority

        <u>Point of Contact:</u> Theresa Simmsons, P.E. (Director of Operations)
        <u>Telephone (804) 523-3320</u>
                <u>Ema</u>   theresa.simmons@rmtaonline.org

RE: Proposal Invitation Name: Toll Collection System Upgrade
        Proposal Number: RMTA TSS-2017
        Proposal Due Date and Time: <u>February 20, 2017 at 1PM ET</u>

Dear Ms. Simmons:

Company Name: _____ hereby offers to provide to the Richmond Metropolitan Transportation Authority the Work indicated in <u>Toll Collection System Upgrade RFP #TSS-2017</u> at the price(s) quoted in Proposer Response to RFP Exhibit G: *Price Proposal Instructions and Forms*, in complete accordance with all terms and conditions of the RFP.

Company Signor: _____ is authorized to legally obligate

Company Name: _____.

We attest to the fact that:

        The company has reviewed and agreed to be bound by all RFP terms and conditions, which shall form the basis of any Contract resulting from this RFP. No new terms and conditions have been added and no existing terms and conditions have been deleted in this RFP Proposal other than as specifically set forth in the Proposal.

        That the prices quoted in the Proposal were established without collusion with other eligible proposers and without effort to preclude the RTMA from obtaining the best possible competitive price; and

                The Vendor has read, signed, and included this RFP and any subsequent addendum(s).

Our official point of contact is _____,

Title _____,

Telephone_____, Email_____

Authorized Signature Printed _____

Authorized Signature _____

Important Note: Vendors are provided an electronic version of the RFP Transmittal Letter. Any electronic alteration to this Transmittal Letter template is prohibited. Any such changes will result in a Proposal being rejected.

Exhibit B: Requirements Compliance Matrix

The Offeror must provide a response to all requirements contained in Tolling Specifications #01 through #06 in the provided Microsoft Excel-based Requirements Compliance Matrix (RCM) named: "*Exhibit B - Requirements Compliance Matrix_RFP.xlsx*" available from RMTA's website http://www.rmtaonline.org. The response shall be submitted electronically as both a Microsoft Excel 2007 (or later) version and an Adobe Acrobat PDF file format. A printed copy of the Requirements Compliance Matrix should not be included in the Offeror's response.

The RCM template includes the following columns:

A. Requirement ID: The identifying number of the requirement.
B. Offeror Response: Coded as follows:
    o Cannot Support Requirement: The business function is not included in the base product. The base product cannot be configured or customized software cannot be developed to meet the required functionality.
        ▪ Included in Base Product: The business function is included in the base product(s) and is fully demonstrable.
    o Configuration Required: The business function can be met by configuring the base product. In this context, "configuration" means that software coding is not required.
    o Customization Required: The business function requires:
        ▪ Customization changes to the base product or software development apart from the base product's existing design, process, or structure;
        ▪ Customized software to be developed to meet the required functionality or to integrate with other software products.
C. Extent of Effort: This field is required if the Offeror's Response to a requirement is "Customization Required" or "Configuration Required". The Extent of Effort must be coded as follows:
    o Trivial: 8 hours or less
    o Low: 9 hours to 80 hours
    o Moderate: 81 hours to 320 hours
    o High: 321 hours and above
D. Offeror Comments: Offeror's comments may be recorded in this column. The Offeror is requested to limit comments to three (3) sentences or less.

Exhibit C: Vendor and Subcontractor Information Statement

EXHIBIT-C-1

VENDOR and SUBCONTRACTOR INFORMATION STATEMENT

VENDOR shall use this (or a facsimile) to document information for the prime Vendor and all SUBCONTRACTORS. Please copy this form as needed to comply with the requirements outlined in the RFP

Prime VENDOR's Name: _____

	PRIME VENDOR	SUBCONTRACTOR #1
Legal Name of Company*		
Company's FEID Number		
Company Contact Name		
Company Address		
City, State, Zip Code		
Company Telephone No.		
Company Fax Number		
Company E-mail address		
Legal Name of Principal(s)		
Address of Principal(s)		
City, State, Zip Code		
Telephone Number of Principal(s)		
Fax Number of Principal(s)		
E-mail address of Principal(s)		
Corporate Number (if applicable)		
License Number		
Status of License or Representation		
Work to be Performed		
SB/DBE Certification# & Exp. Date		

*Exactly as Registered with the Commonwealth of Virginia (i.e. LLC, Inc., P.A., etc.).
This Vendor & Subcontractor Information Statement will become a part of the Contract Documents. Changes made to this Subcontractor Information Statement must be submitted in writing to The Authority for approval prior to that Subcontractor performing the Work.

RMTA TSS2017 Exhibit C

PAGE 2: VENDOR & SUBCONTRACTOR INFORMATION STATEMENT

	SUBCONTRACTOR #2	SUBCONTRACTOR #3
Legal Name of Company*		
Company's FEID Number		
Company Contact Name		
Company Address		
City, State, Zip Code		
Company Telephone No.		
Company Fax Number		
Company E-mail address		
Legal Name of Principal(s)		
Address of Principal(s)		
City, State, Zip Code		
Telephone Number of Principal(s)		
Fax Number of Principal(s)		
E-mail address of Principal(s)		
Corporate Number (if applicable)		
License Number		
Status of License or Representation		
Work to be Performed		
SB/DBE Certification# & Exp. Date		

*Exactly as Registered with the Commonwealth of Virginia (i.e. LLC, Inc., P.A., etc.)   Please duplicate this page as necessary to provide the requested information.

This Vendor & Subcontractor Information Statement will become a part of the Contract Documents. Changes made to this Subcontractor Information Statement must be submitted in writing to The Authority for approval prior to that Subcontractor performing the Work.

By: _____

_____
President or Vice President

Attest: _____

_____
Secretary (or Assistant Secretary)

Witness: (1) _____Signature

(Affix
Print Name
Corporate
Seal)
Signature

Print Name

INDIVIDUAL OR FIRM TRADING AS:

_____
Principal (Vendor)

Signature: _____
Individual or Owner

Witness: _____

(If Partnership, list names and address of each partner on a separate sheet)

Signature: (1) _____

Co-Partner or GP

Signature: (2) _____

Co-Partner or GP

Witness: (1)   _____

Witness: (2)   _____

Witness: (2)   _____

****
****

STATE OF: _____

RMTA TSS2017 Exhibit C

COUNTY OF: _____

On this date, before me personally appeared known to me to be the person(s) whose name(s) is subscribed to the foregoing instrument, and acknowledged to me that they executed the same.

WITNESS my hand and seal, this _____ day of _____, 20_____.
(SEAL)

_____
NOTARY PUBLIC   My Commission Expires: _____

Exhibit D: Vendor Referenced Projects

VENDOR REFERENCED PROJECTS

VENDOR shall use this (or a facsimile) to clearly show how VENDOR meets the RFP requirements as set forth in the Form of Proposal, Section 6.4 Technical Proposal Package, Section 3 – Corporate Qualifications and Demonstrated Experience. Please copy this form as needed to comply with the requirements outlined in the RFP

VENDOR's Name: _____

Reference Project Number:____ of _____

Reference Project Name:	
Relevant Project Customer:	
City:	State:
Phone Number:	Fax Number:
Project Manager:	
Project Manager E-mail:	
VENDOR's role on project and years of participation (mm/dd/yy to mm/dd/yy)	
Project location, scope, cost, start / end dates:	
Operational functionality, number of lanes / plazas, revenue collected, etc.:	
Relevant equipment and systems used:	
Comparison to the Scope of Work for this procurement:	
Installed system performance:	
Key Personnel involved and their role, who are also proposed on the this project:	

_____**Reference Response (For Authority Internal Use)**

RMTA TSS2017 Exhibit D

Exhibit E: Vendor Past Performance

VENDOR PAST PERFORMANCE

VENDOR shall use this (or a facsimile) to document all litigation, claims, dispute proceedings and arbitration as required by Proposal Requirements for past experience for the last ten (10) years. Please copy this form as needed to comply with the requirements outlined in the RFP.

VENDOR's or SUBCONTRACTOR's Name: _____

Project/Issue	Owner/Agency That Initiated Action	Resolution/Outcome	Is Unresolved or Action Outstanding?	Current Owner Contact Name, Telephone & Fax Numbers.

Liquidated Damages:

Project Name	Cause of Delay(s)	Amount Assessed	Describe Outstanding Damage Claims by Any Owner	Current Owner Contact Name, and Telephone & Fax Nos.

Termination for Cause:

Project Name	Describe Reason for Termination	$ Amount Involved	Current Owner Contact Name, Telephone & Fax Nos.

Disciplinary Action:

Project Name	Describe Action Taken	Current Owner Contact Name, Telephone & Fax Nos.

Exhibit F: Key Staff References

KEY STAFF REFERENCES

VENDOR shall use this form to clearly show how VENDOR meets the requirements set forth in the RFP for each key project team member. Each reference provided may be contacted to determine the respondent's ability to meet the Scope of Work and Technical Requirements of this procurement. Copy this form as needed to comply with the requirements of the RFP and the number of references cited.

Key Project Team Member _____

Proposed Position _____

Reference Company Name:	
Address:	
City:	State: Zip Code:
Phone Number:	Fax Number:
Project Manager:	
E-mail:	
Number of total years experience of Key Team Member in similar role to one proposed for this Project:	
Reference Project:	
Key Staff Team Member Role on Project, including dates of participation and job description:	
Project location, scope, cost, start / end dates, etc.:	
Operational functionality, number of lanes plazas, revenue collected, etc.:	
Systems implemented that are relevant to this procurement (ORT, ETC, Cash and Manual In-Lane Systems)	

_____

Reference Response (For Authority Internal Use):

RMTA TSS2017 Exhibit F

Exhibit G: Price Proposal Instructions and Forms

**Price Form Information Must Be Submitted Using
The Authority's Microsoft Excel Spreadsheet File**

**Offerors Are Required To Provide Information
For All Fields Highlighted In Green**

**An Electronic Copy Of This File Will Be Provided
With The Responses To Offeror Questions**

Tab A
Project Summary

Description	As Described In:	Total Cost (lump sum amounts)
Project Management, Documentation, Design and Test Services Work	Tab B of these Price Forms	$0
Host Subsystem	Tab D of these Price Forms	$0
ORT Zones Subsystem	Tab F of these Price Forms	$0
Traditional Lanes Subsystem	Tab E of these Price Forms	$0
Vaults (400 units)	TS-06, section 3.7	$0
For Period Prior to Project Acceptance		
Operations & Maintenance Work	Tab C of these Price Forms	$0
Bonding	Contract Terms	$0
Capital Project Sub-Total		**$0**
Base 5 year term for Operations & Maintenance Work (months 1 through 60 after Project Acceptance)		
Operations & Maintenance Work	Tab C of these Price Forms	$0
Bonding	Contract Terms	$0
Allowance amount for the Extra Work Parts Inventory	TS-02, section 8	to be determined
Total Contract Cost Through The Base O&M Period		**$0**
Optional additional 5 year term for Operations & Maintenance Work (months 61 through 120 after Project Acceptance)	Tab C of these Price Forms	$0
Total Contract Cost Through The Base and Optional O&M Periods		**$0**

Tab B
Project Management, Documentation, Design and Test Services

Work	As Described In:	Total Cost (lump sum amounts)
Project Management	TS-01, section 4	$0
System Integration	TS-01, section 5	$0
System Testing		
Factory Acceptance Test	TS-01, section 7.1	$0
Revenue Service Acceptance Test	TS-01, section 7.2	$0
Project Acceptance Test	TS-01, section 7.3	$0
System Training	TS-01, section 8	$0
Engineer Of Record (EOR)		
Health & Safety Plan	TS-01, section 11.1	$0
Field Surveys	TS-01, section 11.2	$0
Infrastructure Documentation	TS-01, section 11.3	$0
Maintenance Of Traffic	TS-01, section 11.4	$0
Other	(see Note 1)	$0
Total Project Management, Documentation, Design and Test Services Work		**$0**

Note 1: Offeror to provide a detailed breakout of this cost, if any, and attach it to these Price Forms.

Tab C
Operations & Maintenance Work

O&M Work Prior To Project Acceptance	As Described In:	Lump Sum Amounts Through Project Acceptance
On-site Staffing	TS-02, section 4	$0
Management	TS-02, section 5.1	$0
System Monitoring	TS-02, section 5.2	$0
System Tuning & Certification	TS-02, section 5.3	$0
Software Escrow	TS-02, section 5.4	$0
Documentation Updates	TS-02, section 5.5	$0
Maintenance Of Traffic	TS-02, section 5.7	$0
System Maintenance	TS-02, all of section 6 except section 6.4	$0
Toll System Licenses	TS-02, section 6.4	$0
Extended Parts & Labor Warranty	TS-02, section 7	$0
Other O&M Work	Attached details from Offeror	$0
Lump Sum Amount For All O&M Work Prior To Project Acceptance		**$0**

NOTE: A budgetary amount for the Additional Parts Inventory (TS-02, section 8) is shown on Tab A

Tab C
Operations & Maintenance Work

O&M Work For Months 1 Through 60 After Project Acceptance	As Described In:	Lump Sum Amounts (For 60 Months Total)
On-site Staffing	TS-02, section 4	$0
Management	TS-02, section 5.1	$0
System Monitoring	TS-02, section 5.2	$0
System Tuning & Certification	TS-02, section 5.3	$0
Software Escrow	TS-02, section 5.4	$0
Documentation Updates	TS-02, section 5.5	$0
Maintenance Of Traffic	TS-02, section 5.7	$0
System Maintenance	TS-02, all of section 6 except section 6.4	$0
Toll System Licenses	TS-02, section 6.4	$0
Extended Parts & Labor Warranty	TS-02, section 7	$0
Other O&M Work	Attached details from Offeror	$0
Base 5 year term for O&M Work (i.e. total of all monthly O&M payments in Months 1 through 60 after Project Acceptance)		**$0**

NOTE: A budgetary amount for the Extra Work Parts Inventory (TS-02, section 8) is shown on Tab A

Monthly Price For O&M Work In Months 1 Through 12 After Project Acceptance	**$0**

Monthly Price For O&M Work In Months 13 Through 24 After Project Acceptance	**$0**

Monthly Price For O&M Work In Months 25 Through 36 After Project Acceptance	**$0**

Monthly Price For O&M Work In Months 37 Through 48 After Project Acceptance	**$0**

Monthly Price For O&M Work In Months 49 Through 60 After Project Acceptance	**$0**

Tab C
Operations & Maintenance Work

Monthly Price For O&M Work In Months 61 Through 72 After Project Acceptance	**$0**

Monthly Price For O&M Work In Months 73 Through 84 After Project Acceptance	**$0**

Monthly Price For O&M Work In Months 85 Through 96 After Project Acceptance	**$0**

Monthly Price For O&M Work In Months 97 Through 108 After Project Acceptance	**$0**

Monthly Price For O&M Work In Months 109 Through 120 After Project Acceptance	**$0**

Optional 5 year term for O&M Work (i.e. total of all monthly O&M payments in Months 61 through 120 after Project Acceptance)	**$0.00**

Tab D
Host Subsystem

Work	As Described In:	Total Cost (lump sum amounts)
Toll System Management, Transaction Processing and Storage	TS-04, sections 3.1; 3.2; and 3.8	
Hardware	Attached details from Offeror	$0
COTS Software	Attached details from Offeror	$0
Other Software	Attached details from Offeror	$0
MOMS	TS-04, section 3.4	$0
Digital Video Audit	TS-04, section 3.5	$0
Network	TS-04, section 3.6	$0
UPS (including batteries)	TS-04, section 3.7	$0
Ad Hoc Report Tool	TS-04, section 3.11	$0
Computer Rack(s); Other Enclosures; Conduit; Boxes; Cabling; and All Mounting Hardware	TS-03, sections 7 through 10	$0
Electrician Labor	-	$0
Mobilization	-	$0
Other	Attached details from Offeror	$0
Total Host Subsystem Work		**$0**

Tab E
ORT Zones Subsystem

Powhite Parkway Southbound ORT Zone (One 4' Shoulder, Three 12' Travel Lanes, One 4' Shoulder)

Work	As Described In:	Quantity Of Units	Parts $ Per Unit	Labor $ Per Unit	Total Parts $	Total Labor $	Total Cost
Roadside Enclosure(s)	Offeror's Technical Proposal				$0	$0	$0
Roadside Enclosure Mounted Elements							
Zone Controller	TS-05, section 3.3 (see Note 1)				$0	$0	$0
Janus MPR II	TS-05, section 3.6 (see Note 1)				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
Gantry Mounted Elements							
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
In-Pavement Elements							
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
Running sub-total							**$0**

Note 1: Offeror to provide a detailed breakout of the prices shown here and attach it to these Price Forms.

Tab E
ORT Zones Subsystem

Powhite Parkway Southbound ORT Zone (One 4' Shoulder, Three 12' Travel Lanes, One 4' Shoulder)

Work	As Described In:	Quantity Of Units	Parts $ Per Unit	Labor $ Per Unit	Total Parts $	Total Labor $	Total Cost
Running sub-total from previous page							$0
Other Elements							
Digital Video Audit Cameras	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
Conduit, Cabling and Other	(See Note 1)	Lump sum amount for this ORT Zone =					$0
Mobilization	-	Lump sum amount for this ORT Zone =					$0
Removal & Disposal	-	Lump sum amount for this ORT Zone =					$0
Maintenance Of Traffic	TS-05, section 5						
Equipment	(See Note 1)	Lump sum amount for this ORT Zone =					$0
Personnel	(See Note 1)	Lump sum amount for this ORT Zone =					$0
Other	(See Note 1)	Lump sum amount for this ORT Zone =					$0
Other	(See Note 1)	Lump sum amount for this ORT Zone =					$0
Total ORT Zone Subsystem Work At The Powhite Parkway Southbound ORT Zone							**$0**

Note 1: Offeror to provide a detailed breakout of the prices shown here and attach it to these Price Forms.

Tab E
ORT Zones Subsystem

Powhite Parkway Northbound ORT Zone (One 4' Shoulder, Three 12' Travel Lanes, One 4' Shoulder)

Work	As Described In:	Quantity Of Units	Parts $ Per Unit	Labor $ Per Unit	Total Parts $	Total Labor $	Total Cost
Roadside Enclosure(s)	Offeror's Technical Proposal				$0	$0	$0
Roadside Enclosure Mounted Elements							
Zone Controller	TS-05, section 3.3 (see Note 1)				$0	$0	$0
Janus MPR II	TS-05, section 3.6 (see Note 1)				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
Gantry Mounted Elements							
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
In-Pavement Elements							
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
Running sub-total							**$0**

Note 1: Offeror to provide a detailed breakout of the prices shown here and attach it to these Price Forms.

Tab E
ORT Zones Subsystem

Powhite Parkway Northbound ORT Zone (One 4' Shoulder, Three 12' Travel Lanes, One 4' Shoulder)

Work	As Described In:	Quantity Of Units	Parts $ Per Unit	Labor $ Per Unit	Total Parts $	Total Labor $	Total Cost
Running sub-total from previous page							$0
Other Elements							
Digital Video Audit Cameras	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
Conduit, Cabling and Other	(See Note 1)		Lump sum amount for this ORT Zone =				$0
Mobilization	-		Lump sum amount for this ORT Zone =				$0
Removal & Disposal	-		Lump sum amount for this ORT Zone =				$0
Maintenance Of Traffic	TS-05, section 5						
Equipment	(See Note 1)		Lump sum amount for this ORT Zone =				$0
Personnel	(See Note 1)		Lump sum amount for this ORT Zone =				$0
Other	(See Note 1)		Lump sum amount for this ORT Zone =				$0
Other	(See Note 1)		Lump sum amount for this ORT Zone =				$0
Total ORT Zone Subsystem Work Work At The Powhite Parkway Northbound ORT Zone							**$0**

Note 1: Offeror to provide a detailed breakout of the prices shown here and attach it to these Price Forms.

Tab E
ORT Zones Subsystem

Downtown Expressway ORT Zone (One 4' Shoulder, Three 12' Travel Lanes, One 4' Shoulder)

Work	As Described In:	Quantity Of Units	Parts $ Per Unit	Labor $ Per Unit	Total Parts $	Total Labor $	Total Cost
Roadside Enclosure(s)	Offeror's Technical Proposal				$0	$0	$0
Roadside Enclosure Mounted Elements							
Zone Controller	TS-05, section 3.3 (see Note 1)				$0	$0	$0
Janus MPR II	TS-05, section 3.6 (see Note 1)				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
Gantry Mounted Elements							
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
In-Pavement Elements							
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
Running sub-total							**$0**

Note 1: Offeror to provide a detailed breakout of the prices shown here and attach it to these Price Forms.

Tab E
ORT Zones Subsystem

Downtown Expressway ORT Zone (One 4' Shoulder, Three 12' Travel Lanes, One 4' Shoulder)

Work	As Described In:	Quantity Of Units	Parts $ Per Unit	Labor $ Per Unit	Total Parts $	Total Labor $	Total Cost
Running sub-total from previous page							$0
Other Elements							
Digital Video Audit Cameras	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
(Offeror to fill in)	Offeror's Technical Proposal				$0	$0	$0
Conduit, Cabling and Other	(See Note 1)	Lump sum amount for this ORT Zone =					$0
Mobilization	-	Lump sum amount for this ORT Zone =					$0
Removal & Disposal	-	Lump sum amount for this ORT Zone =					$0
Maintenance Of Traffic	TS-05, section 5						
Equipment	(See Note 1)	Lump sum amount for this ORT Zone =					$0
Personnel	(See Note 1)	Lump sum amount for this ORT Zone =					$0
Other	(See Note 1)	Lump sum amount for this ORT Zone =					$0
Other	(See Note 1)	Lump sum amount for this ORT Zone =					$0
Total ORT Zone Subsystem Work At The Downtown Expressway (DTE) ORT Zone							**$0**

Note 1: Offeror to provide a detailed breakout of the prices shown here and attach it to these Price Forms.

Tab F
Traditional Lanes Subsystem

Powhite Parkway Southbound (Mainline Plaza)

Work	As Described In:	Parts $ Per Lane	Labor $ Per Lane	Total Quantity Of Lanes	Total Parts $	Total Labor $	Total Cost
Plaza Servers	See Note 1, if proposing	Lump sum amount for this toll plaza =					$0
Lane Controller:	TS-06, sections 3.2 through 3.5						
Computer & Network Hardware	(See Note 1)			7	$0	$0	$0
Software	(See Note 1)			7	$0	$0	$0
UPS (including batteries)	TS-06, section 3.16			7	$0	$0	$0
Other	(See Note 1)			7	$0	$0	$0
Automatic Vehicle Identification	See Note 1, if proposing new			7	$0	$0	$0
ACM with 4-vault housing located in personnel tunnel	TS-06, section 3.7 (see Note 1)			7	$0	$0	$0
Automatic Gate	TS-06, section 3.8.1			7	$0	$0	$0
Traffic Signal	TS-06, section 3.8.2			7	$0	$0	$0
Manual Lane Terminal	TS-06, section 3.9.1			3	$0	$0	$0
Receipt Printer	TS-06, section 3.9.2			3	$0	$0	$0
Magnetic Stripe Card Reader	TS-06, section 3.9.3			3	$0	$0	$0
Automatic Vehicle Classification	TS-06, section 3.10			3	$0	$0	$0
Violation Image Capture	TS-06, section 3.12 (see Note 1)			1	$0	$0	$0
Digital Video Audit	TS-06, section 3.13 (see Note 1)			7	$0	$0	$0
Other UPS (including batteries)	TS-06, section 3.16	Lump sum amount for this toll plaza =					$0
Conduit, Cabling and Other	(See Note 1)	Lump sum amount for this toll plaza =					$0
Mobilization	-	Lump sum amount for this toll plaza =					$0
Removal & Disposal	(See Note 1)	Lump sum amount for this toll plaza =					$0
Maintenance Of Traffic	(See Note 1)	Lump sum amount for this toll plaza =					$0
Other	(See Note 1)	Lump sum amount for this toll plaza =					$0
Total Traditional Lane Subsystem Work At The Powhite Parkway Southbound (Mainline Plaza)							

Note 1:   Offeror to provide a detailed breakout of the prices shown here and attach it to these Price Forms.

Tab F
Traditional Lanes Subsystem

Powhite Parkway Northbound (Mainline Plaza)

Work	As Described In:	Parts $ Per Lane	Labor $ Per Lane	Total Quantity Of Lanes	Total Parts $	Total Labor $	Total Cost
Plaza Servers	See Note 1, if proposing	Lump sum amount for this toll plaza =					$0
Lane Controller:	TS-06, sections 3.2 through 3.5						
Computer & Network Hardware	(See Note 1)			7	$0	$0	$0
Software	(See Note 1)			7	$0	$0	$0
UPS (including batteries)	TS-06, section 3.16			7	$0	$0	$0
Other	(See Note 1)			7	$0	$0	$0
Automatic Vehicle Identification	See Note 1, if proposing new			7	$0	$0	$0
ACM with 4-vault housing located in personnel tunnel	TS-06, section 3.7 (see Note 1)			6	$0	$0	$0
Automatic Gate	TS-06, section 3.8.1			7	$0	$0	$0
Traffic Signal	TS-06, section 3.8.2			7	$0	$0	$0
Manual Lane Terminal	TS-06, section 3.9.1			3	$0	$0	$0
Receipt Printer	TS-06, section 3.9.2			3	$0	$0	$0
Magnetic Stripe Card Reader	TS-06, section 3.9.3			3	$0	$0	$0
Automatic Vehicle Classification	TS-06, section 3.10			3	$0	$0	$0
Violation Image Capture	TS-06, section 3.12 (see Note 1)			2	$0	$0	$0
Digital Video Audit	TS-06, section 3.13 (see Note 1)			7	$0	$0	$0
Other UPS (including batteries)	TS-06, section 3.16	Lump sum amount for this toll plaza =					$0
Conduit, Cabling and Other	(See Note 1)	Lump sum amount for this toll plaza =					$0
Mobilization	-	Lump sum amount for this toll plaza =					$0
Removal & Disposal	(See Note 1)	Lump sum amount for this toll plaza =					$0
Maintenance Of Traffic	(See Note 1)	Lump sum amount for this toll plaza =					$0
Other	(See Note 1)	Lump sum amount for this toll plaza =					$0
Total Traditional Lane Subsystem Work At The Powhite Parkway Northbound (Mainline Plaza)							

Note 1:   Offeror to provide a detailed breakout of the prices shown here and attach it to these Price Forms.

Tab F
Traditional Lanes Subsystem

Downtown Expressway (Mainline Plaza)

Work	As Described In:	Parts $ Per Lane	Labor $ Per Lane	Total Quantity Of Lanes	Total Parts $	Total Labor $	Total Cost
Plaza Servers	See Note 1, if proposing	Lump sum amount for this toll plaza =					$0
Lane Controller:	TS-06, sections 3.2 through 3.5						
Computer & Network Hardware	(See Note 1)			12	$0	$0	$0
Software	(See Note 1)			12	$0	$0	$0
UPS (including batteries)	TS-06, section 3.16			12	$0	$0	$0
Other	(See Note 1)			12	$0	$0	$0
Automatic Vehicle Identification	See Note 1, if proposing new			12	$0	$0	$0
ACM with 4-vault housing located in personnel tunnel	TS-06, section 3.7 (see Note 1)			8	$0	$0	$0
Automatic Gate	TS-06, section 3.8.1			12	$0	$0	$0
Traffic Signal	TS-06, section 3.8.2			12	$0	$0	$0
Manual Lane Terminal	TS-06, section 3.9.1			6	$0	$0	$0
Receipt Printer	TS-06, section 3.9.2			6	$0	$0	$0
Magnetic Stripe Card Reader	TS-06, section 3.9.3			6	$0	$0	$0
Automatic Vehicle Classification	TS-06, section 3.10			6	$0	$0	$0
Violation Image Capture	TS-06, section 3.12 (see Note 1)			4	$0	$0	$0
Digital Video Audit	TS-06, section 3.13 (see Note 1)			12	$0	$0	$0
Other UPS (including batteries)	TS-06, section 3.16	Lump sum amount for this toll plaza =					$0
Conduit, Cabling and Other	(See Note 1)	Lump sum amount for this toll plaza =					$0
Mobilization	-	Lump sum amount for this toll plaza =					$0
Removal & Disposal	(See Note 1)	Lump sum amount for this toll plaza =					$0
Maintenance Of Traffic	(See Note 1)	Lump sum amount for this toll plaza =					$0
Other	(See Note 1)	Lump sum amount for this toll plaza =					$0
Total Traditional Lane Subsystem Work At The Downtown Expressway (Mainline Plaza)							

Note 1:   Offeror to provide a detailed breakout of the prices shown here and attach it to these Price Forms.

Tab F
Traditional Lanes Subsystem

Forest Hill (All 3 Ramp Plazas)

Work	As Described In:	Parts $ Per Lane	Labor $ Per Lane	Total Quantity Of Lanes	Total Parts $	Total Labor $	Total Cost
Plaza Servers	See Note 1, if proposing	Lump sum amount for these ramp plazas =					$0
Lane Controller:	TS-06, sections 3.2 through 3.5						
Computer & Network Hardware	(See Note 1)			8	$0	$0	$0
Software	(See Note 1)			8	$0	$0	$0
UPS (including batteries)	TS-06, section 3.16			8	$0	$0	$0
Other	(See Note 1)			8	$0	$0	$0
Automatic Vehicle Identification	See Note 1, if proposing new			8	$0	$0	$0
ACM w/ 2-vault housing in booth	TS-06, section 3.7 (see Note 1)			7	$0	$0	$0
Standalone ACM w/ 2-vault housing	TS-06, section 3.7 (see Note 1)			1	$0	$0	$0
Automatic Gate	TS-06, section 3.8.1			8	$0	$0	$0
Traffic Signal	TS-06, section 3.8.2			8	$0	$0	$0
Manual Lane Terminal	TS-06, section 3.9.1			6	$0	$0	$0
Receipt Printer	TS-06, section 3.9.2			6	$0	$0	$0
Magnetic Stripe Card Reader	TS-06, section 3.9.3			6	$0	$0	$0
Automatic Vehicle Classification	TS-06, section 3.10			0	$0	$0	$0
Violation Image Capture	TS-06, section 3.12 (see Note 1)			0	$0	$0	$0
Digital Video Audit	TS-06, section 3.13 (see Note 1)			8	$0	$0	$0
Other UPS (including batteries)	TS-06, section 3.16	Lump sum amount for these ramp plazas =					$0
Conduit, Cabling and Other	(See Note 1)	Lump sum amount for these ramp plazas =					$0
Mobilization	-	Lump sum amount for these ramp plazas =					$0
Removal & Disposal	(See Note 1)	Lump sum amount for this toll plaza =					$0
Maintenance Of Traffic	(See Note 1)	Lump sum amount for this toll plaza =					$0
Other	(See Note 1)	Lump sum amount for these ramp plazas =					$0
Total Traditional Lane Subsystem Work At Forest Hill (All 3 Ramp Plazas)							

Note 1: Offeror to provide a detailed breakout of the prices shown here and attach it to these Price Forms.

Tab F
Traditional Lanes Subsystem

Boulevard Bridge

Work	As Described In:	Parts $ Per Lane	Labor $ Per Lane	Total Quantity Of Lanes	Total Parts $	Total Labor $	Total Cost
Plaza Servers	See Note 1, if proposing	Lump sum amount for this toll plaza =					$0
Lane Controller:	TS-06, sections 3.2 through 3.5						
Computer & Network Hardware	(See Note 1)			6	$0	$0	$0
Software	(See Note 1)			6	$0	$0	$0
UPS (including batteries)	TS-06, section 3.16			6	$0	$0	$0
Other	(See Note 1)			6	$0	$0	$0
Automatic Vehicle Identification	See Note 1, if proposing new			6	$0	$0	$0
ACM with 2-vault housing located in booth	TS-06, section 3.7 (see Note 1)			4	$0	$0	$0
Automatic Gate	TS-06, section 3.8.1			6	$0	$0	$0
Traffic Signal	TS-06, section 3.8.2			6	$0	$0	$0
Manual Lane Terminal	TS-06, section 3.9.1			4	$0	$0	$0
Receipt Printer	TS-06, section 3.9.2			4	$0	$0	$0
Magnetic Stripe Card Reader	TS-06, section 3.9.3			4	$0	$0	$0
Automatic Vehicle Classification	TS-06, section 3.10			0	$0	$0	$0
Violation Image Capture	TS-06, section 3.12 (see Note 1)			2	$0	$0	$0
Digital Video Audit	TS-06, section 3.13 (see Note 1)			6	$0	$0	$0
Other UPS (including batteries)	TS-06, section 3.16	Lump sum amount for this toll plaza =					$0
Conduit, Cabling and Other	(See Note 1)	Lump sum amount for this toll plaza =					$0
Mobilization	-	Lump sum amount for this toll plaza =					$0
Removal & Disposal	(See Note 1)	Lump sum amount for this toll plaza =					$0
Maintenance Of Traffic	(See Note 1)	Lump sum amount for this toll plaza =					$0
Other	(See Note 1)	Lump sum amount for this toll plaza =					$0
Total Traditional Lane Subsystem Work At Boulevard Bridge							

Note 1:   Offeror to provide a detailed breakout of the prices shown here and attach it to these Price Forms.

Tab F
Traditional Lanes Subsystem

2nd Street, 11th Street and Douglasdale (Ramps)

Work	As Described In:	Parts $ Per Lane	Labor $ Per Lane	Total Quantity Of Lanes	Total Parts $	Total Labor $	Total Cost
Plaza Servers	See Note 1, if proposing	Lump sum amount for these ramps =					$0
Lane Controller:	TS-06, sections 3.2 through 3.5						
Computer & Network Hardware	(See Note 1)			8	$0	$0	$0
Software	(See Note 1)			8	$0	$0	$0
UPS (including batteries)	TS-06, section 3.16			8	$0	$0	$0
Other	(See Note 1)			8	$0	$0	$0
Automatic Vehicle Identification	See Note 1, if proposing new			8	$0	$0	$0
Standalone ACM with 2-vault housing on island	TS-06, section 3.7 (see Note 1)			8	$0	$0	$0
Automatic Gate	TS-06, section 3.8.1			0	$0	$0	$0
Traffic Signal	TS-06, section 3.8.2			8	$0	$0	$0
Manual Lane Terminal	TS-06, section 3.9.1			0	$0	$0	$0
Receipt Printer	TS-06, section 3.9.2			0	$0	$0	$0
Magnetic Stripe Card Reader	TS-06, section 3.9.3			0	$0	$0	$0
Automatic Vehicle Classification	TS-06, section 3.10			0	$0	$0	$0
Violation Image Capture	TS-06, section 3.12 (see Note 1)			0	$0	$0	$0
Digital Video Audit	TS-06, section 3.13 (see Note 1)			0	$0	$0	$0
Other UPS (including batteries)	TS-06, section 3.16	Lump sum amount for these ramps =					$0
Conduit, Cabling and Other	(See Note 1)	Lump sum amount for these ramps =					$0
Mobilization	-	Lump sum amount for these ramps =					$0
Removal & Disposal	(See Note 1)	Lump sum amount for this toll plaza =					$0
Maintenance Of Traffic	(See Note 1)	Lump sum amount for this toll plaza =					$0
Other	(See Note 1)	Lump sum amount for these ramps =					$0
Total Traditional Lane Subsystem Work At 2nd Street, 11th Street and Douglasdale (Ramps)							

Note 1:   Offeror to provide a detailed breakout of the prices shown here and attach it to these Price Forms.

Tab F
Traditional Lanes Subsystem

Summary

Work	Total Quantity	Total Parts $	Total Labor $	Total Cost
Plaza Servers	Lump sum (all facilities) =			$0
Lane Controller:				
Computer & Network Hardware	48	$0	$0	$0
Software	48	$0	$0	$0
UPS (including batteries)	48	$0	$0	$0
Other	48	$0	$0	$0
Automatic Vehicle Identification	Lump sum (all facilities) =			$0
ACMs	41	$0	$0	$0
Automatic Gate	40	$0	$0	$0
Traffic Signal	48	$0	$0	$0
Manual Lane Terminal	22	$0	$0	$0
Receipt Printer	22	$0	$0	$0
Magnetic Stripe Card Reader	22	$0	$0	$0
Automatic Vehicle Classification	12	$0	$0	$0
Violation Image Capture	9	$0	$0	$0
Digital Video Audit	40	$0	$0	$0
Other UPS (including batteries)	Lump sum (all facilities) =			$0
Conduit, Cabling and Other	Lump sum (all facilities) =			$0
Mobilization	Lump sum (all facilities) =			$0
Removal & Disposal	Lump sum (all facilities) =			$0
Maintenance Of Traffic	Lump sum (all facilities) =			$0
Other	Lump sum (all facilities) =			$0
Total Traditional Lane Subsystem Work At All Facilities				

Extra Work Pricing Information

Rate Roster For Extra Work

Position/Classification	Regular Hourly Rate, Fully Loaded	Hourly Rate Outside Normal Business Hours, Fully Loaded
Project Manager	$0	$0
Assistant Project Manager	$0	$0
Quality Manager	$0	$0
Software Manager	$0	$0
System Administrator	$0	$0
Network Administrator	$0	$0
System Analyst	$0	$0
Software Architect	$0	$0
Software Development Engineer	$0	$0
Hardware Engineer	$0	$0
CADD Technician	$0	$0
Maintenance Manager	$0	$0
Lead Maintenance Technician	$0	$0
Maintenance Technician	$0	$0
Test Manager	$0	$0
Tester	$0	$0
(Offeror to fill in)	$0	$0
(Offeror to fill in)	$0	$0
(Offeror to fill in)	$0	$0
(Offeror to fill in)	$0	$0
(Offeror to fill in)	$0	$0
(Offeror to fill in)	$0	$0
(Offeror to fill in)	$0	$0
(Offeror to fill in)	$0	$0
(Offeror to fill in)	$0	$0
(Offeror to fill in)	$0	$0
(Offeror to fill in)	$0	$0
(Offeror to fill in)	$0	$0

Extra Work Pricing Information

Extra Work Pre-Specified By The Authority

Work Item	As Described In:	Total Cost (lump sum amounts)
System Confirmation	TS-02, section 9.2	$0

Extra Work Pre-Specified By The Offeror

Work Item	As Described In:	Total Cost (lump sum amounts)
(Offeror to fill in)	Attached details from Offeror	$0
(Offeror to fill in)	Attached details from Offeror	$0
(Offeror to fill in)	Attached details from Offeror	$0
(Offeror to fill in)	Attached details from Offeror	$0
(Offeror to fill in)	Attached details from Offeror	$0

Note, the costs of parts used for Extra Work and for replenishing the Extra Work Parts Inventory are as shown in the Offeror's Bill Of Materials.

Exhibit H: Form of Agreement

AGREEMENT

FOR

TOLL SYSTEM

AND SERVICES

between

RICHMOND METROPOLITAN TRANSPORTATION AUTHORITY

and

_____,
a [_____][corporation][company]

Dated as of _____, 2017

Contents

Exhibit-H-4

ATTACHMENTS:

     A.   Request for Proposals
     B.   Contractor's Proposal
     C.   Pricing and Payment Schedules
     D.   Work Schedules
     E.   Form of Contract Bonds

<div align="center">

**AGREEMENT FOR TOLL SYSTEM
AND SERVICES**

</div>

      THIS AGREEMENT FOR TOLL SYSTEM AND SERVICES (this "*Agreement*") is made and entered into as of the _____ day of _____, 2017 (the "*Effective Date*"), between the **RICHMOND METROPOLITAN TRANSPORTATION AUTHORITY**, a political subdivision of the Commonwealth of Virginia (the "*Authority*" or "*RMTA*"), and _____, a _____ [corporation] [company] duly qualified to do business in the Commonwealth of Virginia (the "*Contractor*") [doing business as "_____"]. In this Agreement, either RMTA or Contractor may be referred to individually as a "*Party*" or collectively as the "*Parties*."

      WHEREAS, RMTA desires to engage a qualified and experienced contractor to provide certain goods and services as more particularly described in RMTA's Request for Proposals No. TSS – _____ and all exhibits, attachments, schedules and any addenda thereto and any documents referenced therein (collectively, the "*RFP*");

      WHEREAS, Contractor has represented to RMTA that it is experienced, qualified and willing to provide such goods and services;

      WHEREAS, RMTA has relied upon such representations to select Contractor for providing such goods and services;

      NOW, THEREFORE, in consideration of the mutual promises and covenants contained herein, the receipt and sufficiency of which are hereby acknowledged, the parties hereto, intending to be legally bound, agree as follows:

1. **Recitals**. The recitals set forth above are true and correct and are incorporated into this Agreement.

2. **Definitions**.   Certain terms used in this Agreement are defined above, while other capitalized terms not specifically defined in this Agreement shall have the same meaning assigned in the RFP to that term and the following words and phrases shall have the following meanings in this Agreement unless the context otherwise requires:

   Business Day shall mean any day other than (i) a Saturday or Sunday, (ii) a day on which the Authority or commercial banks in the Commonwealth of Virginia, are authorized by law to close, or (iii) such other days as the Authority may designate to Contractor.

   Civil Contractor means any contractor, subcontractor or vendor performing any construction, installation, acquisition, renovation, equipping, engineering or similar work in, on, about or with respect to the RMTA Expressway System during the term of this Agreement.

   Commonwealth or *State* shall mean the Commonwealth of Virginia.

<div align="center">- 1 -</div>

Days shall mean calendar days unless otherwise specified in this Agreement.

Implementation Documentation shall mean all plans, calculations, specifications, drawings and other documents as described in TS-01, TS-03, TS-04, TS-05 and TS-06 (in this Agreement, "*TS-xx*" shall refer to the particular numbered Technical (or Tolling) Specification that is set forth in the RFP).

Key Performance Indicator is described in Section 17.3.

Maintenance Documentation shall mean those documents as described in [TS-08].

Pervasive Defect is defined in Section 6.16.

Project or *Toll Equipment Work* shall mean the Base Work and Maintenance Work described in **Section 4** below.

System shall mean those elements of the RMTA toll collection system where Contractor has integrated, installed or provided hardware or software, all as the case may be, as provided under this Agreement and as set forth in the Contract Documents.

3. **Incorporation/Inclusion and Priority of Documents.** The RFP, which is incorporated herein by reference as **Attachment A**, and Contractor's Proposal (and any documents referenced therein) submitted in response thereto, which is incorporated herein by reference as **Attachment B** (collectively, the "*Contractor's Proposal*"), are integral parts of this Agreement. The RFP, Contractor's Proposal, this Agreement (including all amendments, documents, attachments and exhibits referenced in this Agreement) [and Contractor's Best and Final Offer dated _____, 2017] shall be collectively referred to as the "*Contract Documents*" or the "*Agreement*" or this "*Agreement*" and shall govern the contractual relationship between Contractor and RMTA. Each of the Contract Documents is an essential part of the Agreement between Contractor and RMTA, and a requirement occurring in one is as binding as though occurring in all. The Contract Documents are intended to be complementary and to describe and provide for a complete agreement. In the event of a conflict among the Contract Documents, the Contract Documents shall control one over another in the following descending order of precedence:

    A.   Any formally executed amendments to this Agreement, and including changes pursuant to Sections 4.4 through 4.7 hereof;

    B.   This Agreement, including all exhibits, attachments and documents or agreements incorporated by reference;

    C.   The RFP, including all addenda, exhibits and attachments; and

    D.   Contractor's Proposal.

To the extent that the terms of the Contract Documents are in conflict, the Contract Documents shall take precedence based upon the order in which they are listed. If any element or term appears to conflict with any provision, specification, or requirement of

any preceding or higher priority document, the apparent conflicting element or term shall control only if such element or term is expressly addressed as an exception, reservation or caveat or exceeds the requirements set forth in Contract subject to mutual agreement by the parties. In all other instances of conflict, preceding or higher priority documents shall control.

4.   **Scope of Toll Equipment Work**.

    4.1   <u>Base Work</u>.   Contractor agrees to perform the design, integration, testing, installation and other work as described in the RFP and the Implementation Documentation, including but not limited to TS-01, TS-02, TS-03, TS-04, TS-05 and TS-06 and agrees to furnish the software, equipment, other hardware and documentation as described therein (collectively, the *"Base Work")*.   All software, equipment, other hardware and documentation so furnished shall be free and clear of all liens and encumbrances, and not violate any Intellectual Property (as defined in **Section 9.1.3**) rights of any third party.

        All Base Work shall be completed by Contractor within the periods specified in the project schedule set forth in **Attachment D** of this Agreement ("*Base Work Schedule*") and in full cooperation with the RMTA and specified third parties as identified in **Section 6.6** below.

    4.2   <u>Maintenance Work</u>. Contractor agrees to provide maintenance, support and other services and perform other work as described in the RFP, including but not limited to TS-01 and TS-02 and agrees to furnish the software, hardware and documentation as described therein (collectively, the *"Maintenance Work")*. All Maintenance Work shall be completed by Contractor so as to meet or exceed the performance requirements specified in the RFP, including but not limited to TS-02 and in full cooperation with the RMTA and specified third parties as identified in **Section 6.6** below.

    4.3   <u>[Place saver for Alternative Work that may be further specified during the RFP process]</u>

        Changes in this Agreement or the work required as a result of the Authority's undertaking and implementation of the Alternative Work may be accomplished after execution of this Agreement, and without invalidating this Agreement, by change order, construction change directive or order for a minor change in this Agreement, as provided below. Changes in the System shall be performed under applicable provisions of this Agreement, and Contractor shall proceed promptly therewith, unless otherwise provided in the change order, construction change directive or order for a minor change in the System. If the unit prices are stated in this Agreement or subsequently agreed upon, and if quantities originally contemplated are so changed in a proposed change order or construction change directive that application of such unit prices to quantities of work on the System proposed will cause substantial inequity to the Authority or Contractor, the applicable unit prices shall be equitably adjusted.

4.4   Change Orders. A change order is a written instrument entered into between the Authority and Contractor stating their agreement upon items including but not limited to the following:

(1)   a change in the System or the Project;
(2)   the exercise of the options of the Authority described in **Section 4.3** above;
(3)   the amount of any adjustment in amounts due hereunder, as contemplated in **Attachment C (Pricing and Payment Schedules**), with the understanding that pricing adjustments for items or pricing matters not contemplated under **Attachment C (Pricing and Payment Schedules)** may include those methods described under **Section 4.5**;
(4)   the extent of the adjustment in the **Schedule (Attachment D**), if any, and
(5)   Any changes resulting from a change in applicable law as provided under **Section 4.7**.

4.5   Construction Change Directives. A construction change directive is a written order signed by the Authority directing a change in the System and stating a proposed basis for adjustment, if any, in the **Pricing and Payment Schedules (Attachment C)** or the **Schedule (Attachment D**), or both. The Authority may by construction change directive, without invalidating this Agreement, order changes in the System within the general scope of this Agreement consisting of additions, deletions or other revisions of or to, the **Pricing and Payment Schedule (Attachment C)** or the **Schedule (Attachment D**) being adjusted accordingly. A construction change directive shall be used in the absence of total agreement on the terms of a change order. If the construction change directive provides for an adjustment to the **Pricing and Payment Schedules (Attachment C)**, the adjustment shall be based on one of the following methods:

(1)   mutual acceptance of a lump sum properly itemized and supported by sufficient data to permit evaluation;
(2)   unit prices stated in this Agreement, RFP or subsequently agreed upon;
(3)   cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed fee.

Upon receipt of a construction change directive, Contractor shall promptly proceed with the change in the work involved and advise the Authority of Contractor's agreement or disagreement with the method, if any, provided in the construction change directive for determining the proposed adjustment in the **Pricing and Payment Schedule (Attachment C)** or the **Schedule (Attachment D**). A construction change directive signed by Contractor indicates the agreement of Contractor therewith, including adjustment in the **Pricing and Payment Schedule (Attachment C)** or the **Schedule (Attachment D**) or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a change order. If Contractor does not respond promptly or disagrees

with the method the adjustment shall be determined by the Authority on the basis of reasonable expenditures and savings of those performing the work on the System attributable to the change, including, in case of an increase in the **Pricing and Payment Schedule (Attachment C),** a reasonable allowance for overhead and profit. In such case, Contractor shall keep and present, in such form as the Authority may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in this Agreement, cost shall be limited to the following:

(1)   cost of labor, including social security, unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

(2)   costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

(3)   rental costs of machinery and equipment, exclusive of hand tools, whether rented from Contractor or others;

(4)   costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the work; and

(5)   additional costs of supervision and field office personnel directly attributable to the change.

Pending final determination of cost to the Authority, amounts not in dispute may be included in applications for payment. The amount of credit to be allowed by Contractor to the Authority for a deletion or change which results in a net decrease in the **Pricing and Payment Schedule (Attachment C)** shall be actual net cost as confirmed by the Authority. When both additions and credits covering related work on the System, system maintenance or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

If the Authority and Contractor do not agree with the adjustment in **Attachment D (Schedule)** or the method for determining it, the adjustment or the method shall be referred to the General Manager of the Authority for determination. When the Authority and Contractor ultimately reach agreement with any adjustments in the **Pricing and Payment Schedule (Attachment C)** or date of completion of the Toll Equipment Work/extension of **Schedule (Attachment D)**, such agreement shall be effective immediately and shall be recorded by preparation and execution of an appropriate change order.

4.6   <u>Minor Change In The Work</u>.   The Authority will have authority to order minor changes in the Project not involving adjustment in the **Pricing and Payment Schedules (Attachment C)** or date of completion of the Toll Equipment Work or extension of the **Schedule (Attachment D)** and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Authority and Contractor. Contractor shall carry out such written orders promptly.

4.7   Change in Applicable Law. Any final and unappealable change in federal or Virginia law, or court decisions which constitute binding precedent in Virginia, and which significantly alter Contractor's required activities or any change in the availability of funds, shall warrant good faith renegotiation of the compensation paid by or due to Contractor from the Authority and of such other provisions of this Agreement that are affected.

If any other changes to this contract become necessary, a formal contract change order will be negotiated by the Authority and Contractor in each case, to address any changes to the terms and conditions, including the costs of work included under this contract. An approved contract change order must be in writing with proper date and executed by a duly authorized representative of the Authority and placed in the U.S. Mail postage prepaid or delivered by other appropriate means to Contractor prior to the effective date of the contract amendment contemplated by the change order. An approved contract change order is required whenever the change materially (as determined in good faith by the Authority) affects:

(a)   the payment provisions;
(b)   the scope of the Toll Equipment Work;
(c)   date of completion of the Toll Equipment Work or any portion thereof; or
(d)   a change in the date for any deliverables; or a like provision.

Such changes may be necessitated by new and amended Federal and State regulations and requirements. As soon as possible after receipt of a written change request from the Authority, but in no event more than thirty (30) days thereafter, Contractor shall determine if there is an impact on price with the change requested and provide the Authority a written statement identifying any price, schedule and/or performance impacts on this Agreement or to state that there is no impact. In the event that price will be impacted by the change, Contractor shall provide a description of the price increase or decrease involved in implementing the requested change. No change shall be implemented by Contractor until such time as Contractor receives an approved written change order from the Authority.

5.   **Contract Term and Renewal**. This Agreement shall begin on the Effective Date and shall continue until successful completion of the Project Acceptance Test and for an initial period of five (5) years from such successful completion (the "*Initial Term*"). The parties shall agree on what dates constitute the successful acceptance and therefore the dates and period comprising the Initial Term. RMTA has the sole option, in its discretion, to renew this Agreement for one (1) renewal term of five years (the "*Renewal Term*"). Unless RMTA notifies Contractor of its intention not to renew this Agreement, by written notice given at least ninety (90) days prior to the expiration of the Initial Term or any Renewal Term hereunder, this Agreement shall automatically renew upon the terms and conditions set forth herein.

6. **Contractor Responsibilities**.

6.1 Contractor Personnel. Contractor shall provide sufficient professional personnel and staffing to provide the Toll Equipment Work. All persons assigned to perform under this Agreement shall be employees or authorized subcontractors of Contractor and shall be fully qualified to perform the Toll Equipment Work. Contractor and its personnel (and any approved subcontractors and their personnel) shall comply with the confidentiality provisions of **Section 18 (Confidentiality)**. The key personnel that Contractor identifies in its response must be contractually committed for the Project. Any substitution or replacement of key personnel identified in the response shall be subject to the RMTA's prior written consent, not unreasonably withheld.

6.2 Contractor Program Manager. As provided in the RFP, throughout the Initial Term and each Renewal Term, Contractor shall assign a program manager who shall provide the primary point of contact with RMTA, any Civil Contractor and any other third party vendor of RMTA.

6.3 Permits, Licenses. As provided in the RFP, throughout the Initial Term and each Renewal Term, Contractor shall procure and maintain, at its expense, all permits and licenses that may be required in connection with the performance of Toll Equipment Work by Contractor and as otherwise required in the Contract Documents. Contractor shall furnish copies of the permits and licenses upon RMTA's request.

6.4 No Discrimination. At all times during the performance of this Agreement, Contractor agrees as follows:

Contractor will not discriminate, and shall cause any subcontractor to not discriminate, against any employee or applicant for employment because of race, religion, color, sex, national origin, age, disability, or other basis prohibited by state law relating to discrimination in employment, except where there is a bona fide occupational qualification reasonably necessary to the normal operation of Contractor. Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause; and

Contractor will, in all solicitations or advertisements for employees placed by or on behalf of Contractor, state that such Contractor is an equal opportunity employer, provided, however, that notices, advertisements and solicitations placed in accordance with federal law, rule and regulation shall be deemed sufficient for the purpose of meeting the requirements of this provision.

Contractor will include the provisions of both items above in this paragraph in every subcontract or purchase order of over ten thousand dollars ($10,000), so that such provisions will be binding upon each subcontractor or firm.

6.5   Drug-Free Workplace. At all times during the performance of this Agreement, Contractor agrees to:

Provide a drug-free workplace for Contractor's employees;

Post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in Contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition;

State in all solicitations or advertisements for employees placed by on behalf of Contractor that Contractor maintains a drug-free workplace; and

Include the provisions of the foregoing clauses in every subcontract or purchase order of over $10,000, so that the provisions will be binding upon each subcontractor or firm.

6.6   Cooperation.
With Authority. RMTA shall be entitled to full and prompt cooperation of Contractor in all aspects of the Toll Equipment Work. Contractor shall also fully and promptly cooperate with all Civil Contractors, and any third party vendors providing maintenance, transponders, other equipment and/or services to or on behalf of RMTA. In the event Contractor deems that a Civil Contractor or any other of RMTA's contractors/vendors is delaying or not performing their work or otherwise interfering with the Toll Equipment Work, Contractor shall immediately notify RMTA in writing of such matter, including a detailed explanation of such delay so that RMTA may investigate the issue and assist with a resolution. Contractor's failure to furnish a detailed written notification within seven (7) Days after a Civil Contractor or any other of RMTA's contractors/vendors first failed to cooperate with Contractor or otherwise improperly performed their work, shall result in RMTA's denial of any future claim by Contractor that a Civil Contractor or any other of RMTA's contractors/vendors, as applicable, failed to properly perform their work or failed to cooperate with Contractor and Contractor shall be deemed to have waived such claim and Contractor shall be held to any applicable requirement under the Contact Documents that Contractor alleges is affected thereby.

With certain Third Parties. Contractor agrees to cooperate and to assist all Civil Contractors as set forth in the RFP and this Agreement and as reasonably directed by the Authority. Contractor further agrees to cooperate in all reasonable respects and perform its responsibilities, obligations and services in a timely manner to facilitate a Civil Contractor's timely and efficient performance of its applicable work and so as not to delay or interfere with such Civil Contractor's performance of its obligations.

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Contractor shall cooperate with, and coordinate work performed at or in respect of the Project with, other Project contractors, including applicable transition work with existing RMTA contractors on RMTA toll equipment matters, so to provide for orderly and safe work at Project sites and to achieve efficiencies in conduct of the Toll Equipment Work and completion of the Project.

Contractor shall also at all times cooperate with the Virginia Department of Transportation and any third party servicer or agent of VDOT's customer service center, violations processing facility, or replacement facility or system, in connection with the handling and processing of electronic toll collection and violations processing matters, as the Authority may reasonably direct.

6.7   Meetings. RMTA and Contractor shall conduct meetings as provided in the RFP and as deemed needed by RMTA to review, discuss and resolve matters relating to coordination, Toll Equipment Work, and other matters relating to the Contract Documents.

6.8   Material Change in Contractor's Financial Condition. Contractor shall immediately notify RMTA of any material adverse change since the Effective Date in Contractor's financial condition, business, prospects, affairs or operations or of any change of any partner or of such change of any shareholder holding greater than a 10% interest in Contractor, or of the existence of any material impairment of rights or ability of Contractor to carry on as its business and operations are currently conducted.

6.9   Contractor-owned Facilities. Contractor shall have sole responsibility for risk of loss to Contractor-owned facilities, equipment and other goods.

6.10   Registration. All contractors and subcontractors must comply with the registration requirements of Title 54, Chapter 11, Code of Virginia (1950), as amended. To the extent required, all non-resident contractors and subcontractors engaged on the Project shall register with the Department of Labor and Industry under the provisions of Section 40.1-30 of the Code of Virginia (1950), as amended.

This Agreement, and all other contracts and subcontracts are subject to the provisions of Article 3, Chapter 4, Title 40.1, Code of Virginia (1950), as amended, relating to labor unions and the "right to work" and all contractors, or subcontractors, whether residents or non-residents of the Commonwealth of Virginia who perform any work related to this project shall comply with all of the such provisions.

6.11   Standard of Care. Contractor, in performing any services or undertakings under this Agreement, shall perform in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions and in similar locations in the electronic toll collection industry.

6.12   Source of Supply and Quality Requirements.   Contractor shall not use in performance under this Agreement or in prosecution of the goods, services and work any supplier or material person, hereinafter referred to simply as supplier, debarred by the Virginia Department of Transportation ("*VDOT*"). It shall be the responsibility of Contractor to determine from the Department's listings which suppliers are debarred as of any particular date. Such listings will be posted in the office of the VDOT Engineer, 1401 E. Broad Street, Richmond, Virginia and in each District Office. The Authority will not approve for use any material furnished by a supplier debarred by VDOT. If subsequent to the Effective Date, a previously debarred supplier is reinstated to eligibility, the Authority may approve the use of that supplier hereunder when requested by Contractor and after consideration of all relevant factors.

6.13   Barricades and Warning Signs.   Contractor shall comply with VDOT's Virginia Work Area Protection Manual in its conduct of the Toll Equipment Work under this Agreement, as well as comply with the applicable provisions in the Contract Documents concerning maintenance and management of traffic.

6.14   Bucket Truck; Traffic Management.   When Contractor is working on the Project site, RMTA may provide to Contractor bucket trucks and traffic management as and to the extent available, and upon Contractor's successful completion of any training or certification required by the Authority.

6.15   Contract (Performance) Bonds.   Concurrently with the final execution and delivery of this Agreement, Contractor shall provide security to RMTA for its obligations hereunder in the form of a guaranty or contract (performance) bond, substantially in the form of **Attachment E-1**, in the amount of $_____. Such bond shall be issued by a surety listed in the U.S. Dept. of the Treasury Listing of Approved Sureties (Treasury Circular 570) and shall remain in full force during the Initial Term of this Agreement or until full completion of the Base Work, whichever is later. Such bond shall serve as additional security for the performance of Contractor's obligations during such period, and in no event shall the existence of any such bond or security or the stated amount thereof be construed to cap, liquidate or otherwise modify or limit the amount of damages payable by Contractor hereunder based on the occurrence of a Contractor event of default or other liability assumed or incurred by Contractor under this Agreement.

The contract (performance) bond referenced above shall remain in full force and effect until full completion of the Base Work and satisfaction of all contractual obligations in connection therewith. At such time and upon delivery by Contractor of a contract (performance) bond to be in effect during the Maintenance Work, as provided below, RMTA will return the initial contract (performance) bond to Contractor.

During the Maintenance Work phases of the Toll Equipment Work, Contractor shall provide security to RMTA for its obligations hereunder in the form of a guaranty or contract (performance) bond, substantially in the form of **Attachment E-2**. The initial amount of such bond shall be $_____ (or such other amount as RMTA may approve in writing). Such bond shall be renewable annually, with the amount of such bond declining by 20% each year from its initial amount, effective on the anniversary date of the commencement of the Maintenance Work, with the first 20% reduction commencing on the first such anniversary. Such bond shall be issued by a surety listed in the U.S. Dept. of the Treasury Listing of Approved Sureties (Treasury Circular 570) and shall remain in full force during the renewal term of this Agreement or until full completion of the Maintenance Work, whichever is later; provided, however, that Contractor need no longer maintain such bond when the required value amount has declined to zero ($0.00). Such bond shall serve as additional security for the performance of Contractor's obligations during such period, and in no event shall the existence of any such bond or security or the stated amount thereof be construed to cap, liquidate or otherwise modify or limit the amount of damages payable by Contractor hereunder based on the occurrence of a Contractor event of default or other liability assumed or incurred by Contractor under this Agreement. Contractor shall provide RMTA with notice of extension or renewal of such bond, or a similar equivalent security, not later than thirty (30) days prior to its termination.

6.16 <u>Pervasive Defects</u>. Contractor agrees to promptly remedy, at no cost to RMTA any "Pervasive Defect (as defined below). Contractor shall be required to investigate, develop, fix, implement and deploy, at no additional expense to RMTA, all required component or System performance improvements to remediate a Pervasive Defect.

"Pervasive Defect" shall mean, as determined by RMTA in the exercise of its reasonable discretion, any defect, condition or combination thereof, in or pertaining to any equipment, component, sub-component or software that is experiencing continued, persistent or repetitive failure or below specification performance such that frequent or recurrent service, replacement or repair is required.

A resolution plan shall be produced by Contractor and submitted to RMTA within seven (7) days of notification of the Pervasive Defect. The plan shall include the investigation results, remediation steps performed to-date, and a plan and schedule to complete resolution of the Pervasive Defect. The status shall be updated and briefed in periodic meetings until complete resolution.

The obligations set forth in this Section shall be in addition to any warranty obligations set forth in this Agreement. The provisions of this Section shall survive the expiration or earlier termination of this Agreement.

7. **Pricing and Payment**.

7.1 <u>Payment Amounts</u>. Subject to the applicable provisions of this Agreement, RMTA hereby agrees to compensate Contractor in accordance with the prices or on the milestone basis set forth in **Attachment C (Pricing and Payment Schedules)**.

As to Base Work, such prices or basis will not be subject to any increase after the Authority has issued a notice to proceed for the applicable element of the Project and will be considered firm for the duration of the work on such Project elements.

As to Maintenance Work, prices quoted by Contractor in its Proposal or as set forth in the **Pricing and Payment Schedule (Attachment C),** will not be subject to any increase for the Initial Term. The price for any Renewal Term thereafter shall be adjusted up or down in proportion to the change between the U.S. government's Consumer Price Index (*"CPI")* applicable to the Richmond, Virginia metropolitan area (presently, the United States Department of Labor Bureau of Labor Statistics, Consumer Price Index for All Urban Consumers; Washington-Baltimore, DC-MD-VA-WV; Series ID CUURA311SA0, CUUSA311SA0; November 1996=100, or succeeding or replacement index) for the date ninety (90) days prior to the date of commencement of the current Renewal Term (or with respect to pricing for the initial Renewal Term, if any, the date ninety (90) days prior to Project acceptance), and the date ninety (90) days prior to commencement of the succeeding (new) Renewal Term.

Only price changes due to an Authority-approved change order shall be allowed under this Agreement. The Authority shall have the right to purchase additional quantities of hardware, software, installation services, testing services, and other system implementation related services. Contractor grants the Authority the right to make such purchases at any time during the life of this Agreement at the prices quoted in its Proposal or as set forth in **Attachment C (Pricing and Payment Schedules)**. The Authority will issue a change order for each such additional purchase. The price of each such purchase(s) shall be equal to that in Contractor's Proposal adjusted for the change in the CPI which occurred between the applicable notice to proceed and the month prior to issuance of the change order, provided however, CPI will not be applied if there is not a current price in this Agreement for additional purchase items. Reference is hereby made to **Sections 4.4 through 4.6** for terms, conditions and pricing of optional and additional system work where pricing is not provided or not comprehensive.

All payments made by RMTA to Contractor for the Toll Equipment Work under the Contract Documents shall be used by Contractor solely to pay Contractor's employees, agents, assigns, subcontractors, suppliers and any other labor who provided any part of the Toll Equipment Work.

7.2 <u>Payment Schedule</u>. Invoicing for Base Work shall be in accordance with the milestones provided under **Attachment C-1 (Pricing and Payment Schedules)**,

prior to successful completion of the Project Acceptance Test. No payment shall be due and owing to Contractor with respect to any such milestone unless and until Contractor has satisfied all conditions and requirements with respect to such milestone and RMTA has accepted and approved same.

Following successful completion of the Project Acceptance Test, invoicing for Maintenance Work shall be based on a fixed monthly fee as provided in **Attachment C-2 (Pricing and Payment Schedules)**.

7.3   Overpayment.   In the event an overpayment is made to Contractor under this Agreement, Contractor shall immediately refund to RMTA the full amount of any such erroneous payment or overpayment following RMTA's written notice of such erroneous payment or overpayment. If Contractor fails to refund the erroneous payment or overpayment within thirty (30) Days after RMTA's demand therefore, RMTA shall be entitled to interest at one (1%) percent per month, compounded, on the amount not repaid from the date of overpayment. If applicable, RMTA may deduct the amount of overpayment from any subsequent payment owed by RMTA to Contractor.

7.4   Withholding Payments.   RMTA reserves the right to withhold payment or payments in whole or in part, and to continue to withhold any such payments for Toll Equipment Work not completed or not completed in accordance with the Contract Documents. Any and all such payment previously withheld shall be released and paid to Contractor promptly when the Toll Equipment Work is subsequently performed in accordance with the requirements of the Contract Documents.

7.5   Payment not Acceptance. Payment or use of any Toll Equipment Work or portions thereof by RMTA shall not constitute an acceptance of any Toll Equipment Work not performed in accordance with the Contract Documents.

7.6   Liquidated Damages/Price Adjustments.   If Liquidated Damages or Price Adjustments are assessed against Contractor pursuant to **Section 17 (Liquidated Damages; Price Adjustments)**, RMTA shall deduct the same from any payment owing by RMTA to Contractor subsequent to the time any Liquidated Damages or Price Adjustments are assessed. If final payment has been made to Contractor, then Contractor shall reimburse the assessed amount of unpaid Liquidated Damages or Price Adjustments to RMTA within thirty (30) Business Days of written demand therefore by RMTA.

7.7   Net 30 Days. RMTA agrees to pay Contractor in accordance with its normal processes and procedures for all undisputed amounts within thirty (30) Days of receipt of a valid Invoice (defined in **Section 7.8/Invoicing**) and supporting documentation.

7.8   Invoicing. Contractor shall deliver to the attention of RMTA and its designated representatives an itemized invoice (each an "*Invoice*") requesting payment hereunder.

As to Base Work, prior to the successful completion of the Project Acceptance Test (to include any final punch list items and final retainage amounts), Contractor will submit an Invoice, providing an itemized billing, identifying the milestone(s) completed, the status of any on-going work, a detailed account or description of work performed during the time period or milestone period in question to further or complete a milestone. Along with each invoice, Contractor will provide any necessary backup documentation, certifications and test results, as required in the Contract Documents or otherwise reasonably requested by RMTA or its designated representative.   An authorized representative of Contractor must sign each Invoice.

As to any Maintenance Work, Contractor will submit an Invoice on or before the fifteenth (15th) day of each month, providing an itemized billing identifying the month thereof and detailing the Maintenance Work provided and such other information as RMTA or its designated representative may reasonably request. An authorized representative of Contractor must sign each Invoice.

7.9   Monthly Draws. Contractor shall submit an Invoice not more frequently than monthly, unless RMTA agrees otherwise.

7.10   Right of Set Off. RMTA may retain or set off any amount owed to it by Contractor under this or any other contract/agreement between RMTA and Contractor, including as provided in **Section 7.6**.

7.11   Full Compensation. All Toll Equipment Work performed by Contractor in meeting the requirements of the Contract Documents shall be paid as set forth above, which shall constitute full compensation for the Toll Equipment Work including, but not limited to: (a) the cost of all insurance, shipping and handling, job site and other overhead, and profit relating to Contractor's performance of its obligations under this Agreement; (b) the cost of performance of each and every portion of the Toll Equipment Work (including all costs of all Toll Equipment Work provided by subcontractors and suppliers); (c) the cost of obtaining all governmental approvals and all costs of compliance with and maintenance of such governmental approvals; (d) all risk of inflation, currency risk, interest and other costs of funds associated with the progress payment schedule for the Toll Equipment Work as provided herein; (e) payment of any taxes, duties, permits, licenses, and other fees and/or royalties imposed with respect to the Toll Equipment Work and any equipment, materials, supplies, documentation, labor or services included therein; and (f) any and all travel and expenses related thereto.

7.12   Disputed Invoices. RMTA and its designated representatives will review each Invoice and respond with a written request for additional information or

documentation, changes or corrections no later than twenty (20) Days of RMTA's receipt of any applicable Invoice. Contractor shall have seven (7) Days within which to respond to RMTA's request. Based on RMTA's response, Contractor shall submit a new Invoice ("*New Invoice*") incorporating any changes or corrections made by RMTA, together with any additional requested information or documentation. If RMTA agrees with all requests for compensation in the New Invoice, RMTA will pay the entire sum found due within thirty (30) Days of its receipt of the New Invoice. If RMTA disputes any amounts submitted for compensation, RMTA shall pay Contractor amounts not in dispute and notify Contractor within seven (7) Days of its receipt of the New Invoice, identifying those items in the New Invoice that RMTA disputes, along with a written explanation of the basis of the dispute. The provisions of **Section 7.7 (Net 30 Days)** shall not apply to the provisions of this **Section 7.12** and/or any New Invoice. Under no circumstances whatsoever, shall Toll Equipment Work to be provided by Contractor be withheld, disrupted or delayed due to non-payment by RMTA pursuant to this **Section 7.12**.

7.13 No Late Fees. In no event shall Contractor be entitled to charge RMTA late fees, collection fees, attorney's fees, interest, or other fees incurred by Contractor as a result of non-payment by RMTA.

7.14 Contractor Not to Withhold. Contractor may not withhold or disrupt any goods or services or Work to be provided by Contractor hereunder due to non-payment by RMTA hereunder, including pursuant to **Section 7.4** or the default provisions hereof.

7.15 Payments to Subcontractor. Contractor shall:

a. Pay subcontractors within seven (7) days of Contractor's receipt of payment from RMTA for the proportionate share of the payment received for work performed by the subcontractor under the contract; or

b. Notify RMTA and the subcontractor, in writing, of Contractor's intention to withhold payment and the reason. Contractor is obligated to pay the subcontractor interest at the rate of one percent per month (unless otherwise provided under the terms of the contract) on all amounts owed by Contractor that remain unpaid seven (7) days following receipt of payment from RMTA, except for amounts withheld as stated above. The date of mailing of any payment by U.S. Mail is deemed to be payment to the addressee. These provisions apply to each sub-tier contractor performing under this Agreement. Contractor's obligation to pay an interest charge to a subcontractor may not be construed to be an obligation of RMTA.

7.16 Retainage. Except as RMTA may agree otherwise, payments of Invoices for Installation Work shall not include applicable retainage. Retainage in the amount of five percent (5%) of any such invoiced amount shall be withheld by the

Authority from each payment that the Authority makes to Contractor under this Agreement. Retainage associated with Base Work will be delivered to Contractor after successful completion of the Project Acceptance Test and final close-out work for the Base Work, provided that the Authority may withhold at its discretion from the release of the retainage an amount the Authority reasonably determines is necessary to complete or repair any incomplete or non-conforming items at the time of successful completion of the Project Acceptance Test. Payment of the final retainage shall be made in accordance with the provisions of **Sections 7.8** and **7.17.**

7.17   Final Payment. As a prerequisite to the issuance of final payment, Contractor will be required to furnish the Authority with an executed final release of liability (which may be on the Authority's standard form) certifying that all bills, charges and salaries for labor, services, materials and rental of equipment, arising out of the prosecution of work under this Agreement have been fully paid or arrangements satisfactory to the Authority therefore have been made and all other just demands and liens relating to the Project fully satisfied or released, as applicable, or arrangements to the Authority therefore have been made, and releasing the Authority and its representatives from all claims, demands and liability of whatsoever nature from anything done or furnished under this Contract, except to the extent only as to such matters for which unresolved claims have been submitted by Contractor in accordance with the provisions of this Agreement.

8.   **Subcontracting and Assignment**.

8.1   Subcontracting or Assignment. It is the intent of RMTA that Contractor shall perform, with its own organization, contract work amounting to at least [fifty-one percent (51%)] of the Toll Equipment Work, unless RMTA agrees otherwise. Accordingly, other than as specifically specified in the RFP or Contractor's Proposal, Contractor shall not assign, subcontract, delegate, sublet or transfer this Agreement or any rights under or interest in this Agreement or otherwise dispose of its right, title or interest therein or any part thereof to any person, or otherwise permit anyone other than Contractor's personnel to perform any of the Toll Equipment Work, furnish the Documents or provide the Toll Equipment under this Agreement, without obtaining the prior written consent of RMTA, which RMTA may grant, deny or condition in its sole discretion or for any reason. For purposes of this provision, a sale or transfer of the ownership interests or all, or substantially all, of the assets of Contractor (or Contractor's parent company), a merger (by operation of law or otherwise), consolidation, exchange, a change of control or other business combination involving Contractor or Contractor's parent company shall be deemed an assignment, regardless of whether such transaction results in Contractor (or its parent, as applicable) being the surviving or disappearing corporation. A change of control shall mean if any other person or entity acquires, at a minimum, a fifty percent (50%) direct or indirect ownership interest in, or control over, Contractor and/or Contractor's parent company.

Consent by RMTA to any transfer, assignment or subcontract of this Agreement shall not be deemed to relieve Contractor of its obligations under this Agreement. Any attempted transfer, subcontracting or assignment without such prior written consent shall be void and of no force and effect. Contractor warrants that it shall make timely payments for work performed to any subcontractor or supplier hereunder and Contractor shall indemnify and hold harmless RMTA for any breach of this warranty.

8.2 <u>Subcontractor Assignments and Changes in Control</u>. Contractor shall cause the provisions of Section 8.1 hereof to be set forth, *mutatis mutandis*, in all material subcontracts, or as may be required by RMTA, with the consent rights running in favor of RMTA.

8.3 <u>Contractor Remains Responsible</u>. If Contractor properly subcontracts any of the Toll Equipment Work to be performed under this Agreement, Contractor shall remain as fully responsible to RMTA for the acts, errors, or omissions of Contractor's subcontractor and/or supplier and of the persons employed by them as Contractor is for the acts and omissions of persons directly employed by Contractor. Contractor shall be obligated to assist RMTA in the enforcement of any rights against Contractor's subcontractor that RMTA has against Contractor. Notwithstanding any subcontract or agreement with any subcontractor or third party, Contractor shall be fully responsible for furnishing all of the Toll Equipment Work.

8.4 <u>Failure to Comply</u>. Any assignments or subcontracts made in violation of **Sections 8.1 (Assignment)**, **8.2 (Subcontracting)** and/or **8.3 (Subcontractor Assignments and Change in Control)** shall be null and void.

9. **Warranties**. In addition to any express or implied warranties provided by law, Contractor hereby expressly represents and warrants:

9.1 <u>Express Warranties</u>.

9.1.1 *Work*. Contractor represents and warrants that all Base Work and all Maintenance Work shall (i) conform to the performance, capabilities, accuracy, completeness, characteristics, specifications, configurations, standards, and functions required by the Contract Documents, and (ii) be performed on time as required in the Contract Documents, and in a workmanlike manner, consistent with the highest level of care and skill exercised by other providers of similar work under similar circumstances at the time the work is performed.

Contractor shall, at its sole cost, repair or replace, at its option, any item of hardware, equipment, support services, software or firmware or any construction item whose non-performance is discovered or which is defective either in material or workmanship and made known to

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Contractor in writing by the Authority during the contract warranty period which is six (6) months from the date of "warranty commencement," which is deemed to commence upon successful completion of the Project Acceptance Test.

Except as set forth herein or with regard to any express or implied warranties provided by law, the express warranties are the sole and exclusive warranties provided by Contractor, and Contractor specifically disclaims any other warranties, express or implied including but not limited to warranties of merchantability or fitness for a particular purpose, as well as any warranties alleged to have arisen from custom, usage or past dealings between the parties.

9.1.2 *Cooperation.* Contractor represents and warrants that Contractor shall fully cooperate with RMTA, RMTA's other contractors and vendors, and any other governing authority, in performing all Base Work and all Maintenance Work required by the Contract Documents.

9.1.3 *Intellectual Property.* As used in this Agreement, "*Intellectual Property*" shall mean any and all works, know-how, inventions, patents, copyrights, models, designs, trademarks, trade dress, trade secrets, discoveries, regulatory filings, or other information (whether or not patentable and whether or not in tangible or intangible form), information and data; formulas, procedures and processes; designs, drawings, sketches and models; computer programs (in both source code and object code); documentation, notes and specifications; trade secrets; discoveries, developments, improvements and inventions, and any other industrial or proprietary rights, and any documentation relating thereto, and any and all applications for any of the forgoing, whether or not registered as of the Effective Date or at any later date .

9.1.4.1 Contractor represents and warrants that RMTA will have, upon completion of the Base Work and shall additionally receive without restriction thereafter, all necessary patent, copyright, and any other necessary intellectual property rights to all Base Work furnished by Contractor under this Agreement and that all Base Work and Maintenance Work, as a whole and each of its components shall not infringe any third party patent, copyright, trademark, trade secret or other intellectual property right.

9.1.4.2 Contractor represents and warrants that it is the lawful owner or licensee of all software, firmware, hardware, methods, methodologies and any Intellectual Property used in the Base Work and Maintenance Work and Contractor has the right to convey to, or permit RMTA access to or use of, such software,

firmware, hardware, methods, methodologies and Intellectual Property;

9.1.4.3 Contractor represents and warrants that RMTA's use of the Intellectual Property for, in, on and in respect of the Base Work and Maintenance Work in accordance with the Contract Documents will not infringe any patent, copyright, utility model, industrial design, trade secret, confidential information, or any other proprietary right or Intellectual Property right of any third party.

9.1.5 *Compliance with Laws, Rules and Regulations*. Contractor represents and warrants that (a) the Base Work and Maintenance Work will not be in violation of any applicable law, rule or regulation, and Contractor will obtain all permits and licenses required to comply with such laws and regulations, (b) Contractor is registered with all applicable state and local authorities and is authorized to perform the Base Work and Maintenance Work in the Commonwealth of Virginia, and (c) Contractor will comply in all respects with all other laws, rules, regulations, ordinances of any governing authority that impact or relate in any way to the Base Work and Maintenance Work.

9.1.6 *Good Title*. Contractor will convey good and marketable title to all goods and services, including but not limited to software, provided under this Agreement upon RMTA's receipt of such goods and services, and all goods and services shall be delivered to RMTA free from all security interests or other liens or encumbrances. Contractor also agrees to defend RMTA's title against all persons claiming ownership or other interest in the whole or part of any goods and services supplied to RMTA under this Agreement;

9.1.7 *Software*. All proprietary or custom software and firmware provided hereunder or present in the Toll Equipment and any update or revision to any of such software and firmware will be maintained up to date as provided in the Contract Documents and free from defects, and will meet all specifications set forth in this Agreement and the Contract Documents. Contractor will, without charge to RMTA, correct any defects and make any fixes, additions, modifications or adjustments to any of such software or any update or revision to such software as may be necessary to keep the software in operating order in accordance with specifications at all times throughout the term of this Agreement.

9.1.8 Contractor hereby irrevocably assigns and transfers to the RMTA all worldwide right, title, and interest (including without limitation all copyright, patent, trademark and trade secrets rights) in and to the Intellectual Property created, made, conceived, reduced to practice, or

authored by Contractor (including by any employee and permitted subcontractor of Contractor), either solely or jointly with others, pursuant to this Agreement or with the use of information, materials, or facilities of the RMTA received by Contractor during the term of this Agreement (the "*Developed Intellectual Property*"). In furtherance of the foregoing, the RMTA shall have the sole right to determine the treatment of any Developed Intellectual Property, including the right to keep Developed Intellectual Property as trade secrets, to file and execute patent applications on Developed Intellectual Property, to use and disclose Developed Intellectual Property without prior patent application, to file registrations for copyright or trademark on Developed Intellectual Property in its own name, or to follow any other procedure that the RMTA deems appropriate. Contractor shall promptly disclose to the RMTA all Intellectual Property created by Contractor or on its behalf (including by any employee and permitted subcontractor of Contractor) during the term of this Agreement. Contractor shall cooperate with and assist the RMTA to apply for, and to execute or cause to be executed, all documents (including all applications and/or assignments) and perform such acts as may be necessary, useful or convenient to secure for the RMTA statutory protection throughout the world for all Developed Intellectual Property assigned to the RMTA pursuant to this Section 9.1.8. Contractor represents and warrants that all employees and permitted subcontractors performing Toll Equipment Work pursuant to this Agreement have agreed in writing to assign all Developed Intellectual Property to the RMTA as required by this Section 9.1.8.

When and if, from time to time, Contractor provides RMTA with a revision or update to the Developed Intellectual Property, Contractor shall within ten (10) business days thereafter deliver updated Source Code to the Software Escrow Agent as provided in Section 15.

"*Source Code*" means a complete copy, expressed in high-level (*i.e.*, human readable; not machine language or object code) computer language, of the software which, when assembled or compiled, becomes the executable object code of the software. Source Code shall include all material including but not limited to design documentation, software documentation, reference manuals and documentation, libraries for the software, and interface software (patch or whole programs), in any form (printed, electronic, or magnetic) and any other information necessary that a reasonably skilled programmer or analyst can understand and maintain the software.

9.2   Third Party Warranties. Contractor shall assign to RMTA the manufacturers' or other third party warranties for software, equipment and other hardware furnished to RMTA.

9.3   No Waiver. Neither any provision of this Agreement nor any decision of RMTA shall relieve Contractor of responsibility for faulty materials, faulty workmanship, or omission of any software, equipment and other hardware.

9.4   Contractor Duty to Remedy. Contractor shall, within fifteen (15) Days of Contractor's receipt of notice of a defective item of Base Work or Maintenance Work, correct, remedy, replace, re-execute, supply omitted or defective software, equipment and other hardware and pay for any damage to other work resulting therefrom, without expense to RMTA and ensure RMTA's receipt of a replacement at a location specified by RMTA. Correction of defective Base Work or Maintenance Work or supplying of omitted Base Work or Maintenance Work whether or not covered by warranty of a manufacturer, subcontractor or supplier of Contractor, remains the primary, direct responsibility of Contractor. Contractor agrees to receive and accept any shipments of defective Equipment sent to Contractor by a representative designated by the RMTA.

        Subject to the warranty set forth in **Section 9.1** hereof, neither approval of work, nor final payment shall relieve Contractor of legal responsibility for faulty materials or workmanship, subject to the warranty provision herein, and Contractor shall promptly remedy any defects due thereto and pay for any damage to other work resulting therefrom, provided that RMTA can reasonably demonstrate that any such defect, damage or work is attributable to Contractor's work.

9.5   RMTA Cure. If Contractor does not remove, make good the deficiency, correct, or remedy defective Base Work or Maintenance Work, or supply any omitted Base Work or Maintenance Work within the time periods set forth under this Agreement, then RMTA may, in addition to all other remedies available to RMTA under this Agreement, at law or in equity, after ten (10) Business Days written notice to Contractor, remove the Base Work or Maintenance Work, correct the Base Work or Maintenance Work, remedy the Base Work or Maintenance Work or supply omitted Base Work or Maintenance Work at the expense of Contractor. If RMTA has not yet made payment to Contractor, then RMTA may deduct the cost thereof from any payment then or thereafter due and owing Contractor. If final payment has been made to Contractor, then Contractor shall reimburse the cost to RMTA within five (5) Business Days of written demand therefore by RMTA. In case of emergency involving health, safety of property, or safety of life, RMTA may proceed at once and without notice to Contractor and Contractor shall remain responsible for the cost thereof.

9.6   Remedies Not Exclusive. The remedies stated in this **Section 9** are in addition to the remedies otherwise available to RMTA, do not exclude such other remedies, and are without prejudice to any other remedies.

10.   **Relationship of the Parties**. Each Party, in the performance of this Agreement, shall be acting in its individual capacity and not as an agent, employee, partner, joint venturer, or

associate of the other Party. The employees, agents, partners or contractors of one Party shall not be deemed or construed to be the employees, agents, partners or contractors of the other Party for any purposes. Neither Party shall assume any liability of any type on behalf of the other Party or any of such other Party's employees, agents, partners or contractors. The parties expressly understand and agree that Contractor is an independent contractor of RMTA in all manner and respects. Contractor shall be solely responsible for all payments to its subcontractors, agents, consultants, suppliers, employees, partners or any other parties with which it does business including, but not limited to, paying all benefits, taxes and insurance, including workmen's compensation insurance, for its employees. Except as RMTA may otherwise specify in writing, Contractor shall have no authority, express or implied, to act on behalf of RMTA in any capacity whatsoever, as an agent or otherwise, and shall have no authority, express or implied, to bind RMTA or its members, agents or employees, to any obligation whatsoever, unless expressly provided in this Agreement.

11.   **Proprietary Information**. Except as may specifically be set forth in this Agreement, ownership of all materials, drawings, manuals, training materials and documentation originated and prepared for the Authority pursuant to the RFP and under this Agreement, together with all updates, supplements and amendments thereto, shall belong exclusively to the Authority. Contractor is hereby advised that such material is subject to public inspection and disclosure in accordance with the Virginia Freedom of Information Act.

Trade secrets or proprietary information may not be subject to public disclosure as and to the extent provided under the Virginia Freedom of Information Act, provided that Contractor has properly invoked the protections of Section 2.2-4342.F of the Virginia Public Procurement Act of the Code of Virginia, in writing, either before or at the time the data is submitted or disclosed. The written notice must specifically identify the data or materials to be protected and state the reasons why protection is necessary. The proprietary or trade secret material submitted must be identified by some distinct method such as highlighting or underlining and must indicate only the specific words, figures, or paragraphs that constitute trade secret or proprietary information. The classification of any entire document, line item prices or prices as proprietary or trade secret is not acceptable.

12.   **Title and Delivery**.

12.1   Title. Title to the hardware components provided pursuant to this Agreement shall pass to the Authority upon receipt of payment associated with such hardware from the Authority and installation at the respective Authority work site. Contractor represents and warrants that it will have absolute and good title to the hardware components, free and clear of all liens, encumbrances or any claims of any kind whatsoever at the date of the transfer of title and it will transfer same to the Authority. Notwithstanding the fact that the Authority may have been deemed to have accepted title in accordance with the previous Section, title acceptance is contingent upon full system acceptance by the Authority, accordingly, in the event the system is not fully accepted by the Authority as contemplated by this

agreement, it shall have the right, at is election, to reject title to any or all components comprising all or any part of the system, and thereupon receive a refund from Contractor for any amounts paid for such rejected items.

12.2   Shipping. Contractor shall confirm receipt of all shipping orders and manifests with the Authority in writing. No terms or conditions, preprinted or otherwise, on Contractor's confirmation or any other documentation supplied by Contractor shall be effective or otherwise govern any transactions between RMTA and Contractor and all such preprinted terms are hereby declared null and void. Contractor shall be responsible for all transportation charges to the FOB Destination Point, Freight Prepaid, with such point being RMTA's designated delivery location(s) specified in each P.O. This point shall also be the point at which RMTA takes title to the delivered Equipment in accordance with **Section 9.1.8 (Good Title)**.

12.3   Delivery. All deliveries made must be complete unless otherwise agreed to in writing by RMTA. All packages must contain a packing slip that identifies all items included with the shipment and RMTA's contract, work or purchase order number.   Acceptance of the delivery occurs after delivery to the specified location(s) and RMTA or their designated representative inspects the shipment and acknowledges in writing that the contents appear to conform to the Contract Documents. Equipment ordered shall be delivered in accordance with the project schedule set forth in **Attachment D** and the RFP (unless a shorter time period is included in Contractor's Proposal, in which case such shorter time period shall control).

12.4   Risk of Loss. Regardless of the FOB point, Contractor shall assume the risk of loss for all software, equipment and other hardware until its delivery at the specified location and its installation as a part of the System.

12.5   Storage of Material and Equipment. Contractor shall be responsible for proper security of all storage areas under its control and shall take all reasonable precautions and provide protection to prevent damage, injury or loss to the materials and equipment provided for under the Agreement.

13.   **Support Services.** Contractor understands and agrees that:

13.1   Personnel. Contractor may be required to assign personnel, as needed, who are highly experienced with the Toll Equipment to positively and actively engage with all Civil Contractors or the Authority or its third party vendors to answer questions concerning the installation of the Toll Equipment; to troubleshoot any problem that may arise during the installation of the Toll Equipment; and to do all other things necessary, desirable or appropriate to perform the Base Work and Maintenance Work.

13.2   <u>Delay by Third Party</u>. In the event Contractor deems that a third party is delaying Contractor's ability to perform under this Agreement or not performing, Contractor shall immediately notify RMTA in writing of this matter, including a detailed explanation of such delay so that RMTA may investigate the issue and assist with a resolution. Contractor's failure to furnish a detailed written notification within two weeks after the third party first failed to cooperate with Contractor shall result in RMTA's denial of any future claim by Contractor that the third party has caused Contractor to fail to meet the agreed-upon schedule or properly perform the Base Work or Maintenance Work or failed to cooperate with Contractor, and Contractor shall be deemed to have waived such claim.

13.3   <u>RMTA's Right to Remove</u>. RMTA shall have the absolute right to require Contractor to remove an individual from performing under this Agreement for any or no reason. In the event of such removal, Contractor will replace such individual within the time specified by RMTA.

14.   **Inspection**. As to the testing or approval of any software, equipment or other hardware, Contractor shall give RMTA timely notice in writing of its readiness for inspection and testing, and if the inspection is by any authority other than RMTA, of the date fixed for such inspection. Contractor assumes the responsibility of furnishing all test items in accordance with this Agreement. No provisions of this **Section 14** nor any inspection by RMTA, representatives of RMTA, or any other third party shall in any way diminish, relieve, or alter the responsibility and undertaking of Contractor; nor shall the omission of any of the foregoing to discover or to bring to the attention of Contractor the existence of any software, equipment or hardware that is not in accordance with the Contract Documents in any way diminishes, relieves, or alters the obligations of Contractor nor shall the aforesaid omission diminish or alter the rights or remedies of RMTA as set forth in this Agreement.

15.   **Delivery of Software.** Within 10 days of [designated milestone (as specified in **Attachment D**)], Contractor shall deposit, or cause the deposit of, all system software and its related Source Code (*i.e.*, human-readable and as defined in Section 9.1.8) and object code ((*i.e*., machine readable) in a format that is commonly used in the industry in an escrow (the "Software Escrow") with an escrow company designated by Contractor that is engaged in the business of receiving and maintaining escrows of software source code, related documentation and other technology (the "Software Escrow Agent"), subject to the reasonable approval of RMTA. All terms and conditions of such agreement (the "Software Escrow Agreement") shall be a part of, and by this reference are incorporated in, this Agreement, and any breach thereof by Contractor shall be a breach of this Agreement. Contractor's failure to execute the Software Escrow Agreement and any breach by Contractor of such Software Escrow Agreement shall be deemed a default under Section 27.1.11 hereof. In connection with the foregoing, RMTA shall pay the reasonable charges assessed by the Software Escrow Agent.

Each of the following shall constitute a **"Release Event"** for purposes of this Agreement and the Software Escrow Agreement:

Exhibit-H-31

a. presentation to the Software Escrow Agent of an endorsed file copy of a voluntary petition in bankruptcy naming Contractor as debtor;

b. notification by Contractor to RMTA that the Software Escrow materials, including the Source Code, will no longer be supported, including applications support;

c. Contractor otherwise goes out of business or no longer offers support for the Software Escrow materials, including the Source Code;

d. RMTA presents to the Software Escrow Agent a final, unappealable order of court in an action to which Contractor is a named party allowing access to the Software Escrow materials, including the Source Code; or

e. any proceeding seeking involuntary reorganization, arrangement, bankruptcy, readjustment, liquidation, dissolution, or similar relief as filed against Contractor under any present or future statute, law, or regulation which is admitted or not dismissed within sixty (60) days or if any trustee, receiver or liquidator of all or a substantial part of its business, assets or properties is appointed with or without Contractor's consent or acquiescence in such appointment and is not vacated within sixty (60) days.

In the event that Contractor transfers or assigns its interests in the Software Escrow materials, including the Source Code, to a third party, the aforementioned conditions shall continue to apply to the third party to which the Software Escrow materials, including the Source Code, is transferred or assigned.

16. **Delay and Extensions of Time**. If Contractor is delayed in the progress by any act, failure to act, or neglect of RMTA (including RMTA's contractors, vendors, suppliers or consultants), or by an event listed in **Section 35.3**, then the time of completion set forth in the Schedule shall be extended for such reasonable time as RMTA may decide in its sole discretion after consultation with Contractor, and the associated contract price may be adjusted as RMTA and Contractor mutually agree. Contractor expressly agrees that Contractor's sole and exclusive remedy for such delay shall be an extension of contract time any mutually agreed upon change in the associated contract price, and that Contractor shall make no demand for any damages. No such extension shall be made for delay occurring more than ten (10) Days before claim thereof is made in writing to RMTA. In the case of a continuing cause of delay, only one claim is necessary, but no claim for a continuing delay shall be valid unless Contractor, within ten days from the cessation of the delay, shall have given notice in writing to RMTA, with copy to RMTA, as to the amount of additional time claimed and any request for a change in the associated contract price, which shall be accompanied by full justification to support such requested change.

17. **Liquidated Damages; Price Adjustments**.

    17.1   <u>Liquidated Damages</u>.   Contractor agrees that liquidated damages shall be imposed by this Agreement. The terms below shall in no way be considered exclusive and shall not limit the Authority or Authority's right to pursue any other additional remedy which the Authority may be entitled to pursue.

        Contractor shall pay to the Authority liquidated damages as follows:

Requirement	**Associated Liquidated Damages**
Contractor shall successfully complete in accordance with the terms of this Agreement the Revenue Acceptance Test for all material parts of the Base Work by _____, **2019**	Where Contractor does not successfully complete Revenue Service Acceptance Test of all material parts of the Base Work in accordance with the terms of this Agreement by _____, **2019**, Contractor shall pay [$1,350]* [$2,500]* [$3,100]* for each day of delay or portion thereof [*_Drafting note: this amount to be completed in accordance with VDOT's 2016 Road and Bridge Specifications, Section 108.06, Table I-1 (Schedule of Liquidated Damages)], based on the contract amount for the Base Work_]

        The total amount of such liquidated damages shall not exceed the total amounts authorized by notice to proceed and contract change orders subsequently approved by the Authority.

    17.2   <u>Difficulty of Ascertaining Certain Damages</u>. The amount of liquidated damages as set forth or referenced in **Section 17.1** is fixed and agreed to by and between Contractor and RMTA because both Parties agree and acknowledge the impracticability and extreme difficulty of fixing and ascertaining the true value of the damages which RMTA will sustain by failure of Contractor to meet certain performance criteria, such as loss of revenue, RMTA's being found in breach of third party contracts, service charges, interest charges, harm and inconvenience to the public, delays caused to other activities of RMTA by failure to perform this Agreement, and other damages, some of which are indefinite and not susceptible of easy proof, such amounts were actively negotiated between the Parties, and are in each instance agreed by both Parties to be a reasonable estimate of the amount of damages which RMTA will sustain in each instance and such amount shall be deducted from any monies due or that may become due to Contractor. Liquidated damages as specified or referenced in **Section 17.1** will be deducted from any money due Contractor, not as a penalty, but as a reasonable estimate of RMTA's damages; provided however, that due consideration shall be taken of any

adjustment of the time for performance granted under the provisions of **Section 16 (Delays and Extension of Time)**.

17.3   Price Adjustments.   Contractor is responsible for Contractor's Base Work, the Maintenance Work and the System meeting all of the requirements set forth in this Agreement and the Technical/Tolling Specifications during all phases of the Toll Work (including all installation phases, all maintenance phases before success completion of a project and/or revenue acceptance test, and all subsequent maintenance phases) and for the life of this Agreement, including the renewal term, if any.   The Authority intends to focus on the outcomes of these responsibilities using the metrics described below, each of which is hereafter referred to as a "Key Performance Indicator" or KPI.   The Authority has selected KPIs to provide a high confidence in all System performance and reflect the minimum tolerable performance expected of Contractor to avoid unnecessary impact to the Authority, the general public, the VDOT customer service center and other third parties, including but not limited to other electronic toll collection and violations processing vendors.   The final amount that the Authority pays to Contractor for Maintenance Work will be based on Contractor's ability to continually meet the KPIs.   Price Adjustments shall not be made for events or circumstances attributable to Force Majeure or any other event or circumstance beyond the reasonable control of Contractor.

Appendix A of TS-02 lists the KPIs, the measurement frequency for each and the non-compliance points for each in a scorecard format.   The point values shown there reflect the number of non-compliance points assessed for each deviation from the KPI and the points escalate whenever non-compliance is not resolved in subsequent months.

Contractor shall use commercially reasonable best efforts to minimize the impacts that result from failure to meet each KPI, regardless of whether invoice adjustments are made.   Furthermore, Contractor shall take corrective action to immediately remedy any failures and provide a Corrective Action Plan (CAP) to the Authority that documents the corrective action taken to prevent future reoccurrence of the problem associated with the non-compliance.   All CAPs shall be subject to the Authority's approval.

17.3.1   KPI Reporting.   As part of the monthly invoice for Maintenance Work, Contractor shall provide a KPI compliance report listing areas of compliance and detailing failures that resulted in non-compliance.   Regardless of how often a KPI is measured, Contractor shall provide reporting for all KPIs monthly.   Contractor shall use KPI measurement and reporting methods developed collaboratively with the Authority to produce this report.   All such measurement and reporting methods shall be subject to the Authority's approval.

17.3.2   KPI Points.   Where Contractor fails to meet a KPI, the Authority will assess non-compliance points for each failure.   The amount by which the KPI is

missed matters in determining how well the System is performing so the non-compliance points for a particular failure are increased as the deviation from the KPI increases. Thus, by way of example, if there were a KPI requiring a System element to be available 99.95% of the time and 1 point was to be assessed for each 0.1% or portion thereof below the compliance level:

- If the actual availability was measured to be 99.85%, Contractor would be assessed 1 non-compliance point for this Key Performance Indicator.

- If the actual availability was measured to be 99.00%, Contractor would be assessed 10 non-compliance points for this Key Performance Indicator.

Escalation is then applied to this Key Performance Indicator based on how long the non-compliance has continued, as detailed below. Similar calculations apply to each of the other KPIs as shown in TS-02. The sum total of non-compliance points (with escalation) from KPIs no. 1 through no. 15 as set forth in TS-02 is then used to determine the non-compliance price adjustment.

17.3.4 <u>Escalation and KPI Scoring</u>. Non-compliance points will accrue as follows:

- In the first month that a specific KPI is not met, there is no escalation and only the non-compliance points are used to score the KPI;

- In the second consecutive month that a specific KPI is not met, the non-compliance points will be doubled (*i.e.*, an escalation multiplier of 2 will apply) to score the KPI for the month;

- In the third consecutive month that a specific KPI is not met, the non-compliance points will be quadrupled (*i.e.*, an escalation multiplier of 4 will apply) to score the KPI for the month; and

- In every consecutive month thereafter that the specific KPI remains unmet, the non-compliance points will be quadrupled (*i.e.*, an escalation factor of 4 will be applied) to score the KPI for each such month.

17.3.5 <u>Non-Compliance Price Adjustments</u>. Non-compliance points will be summed, the total of which will determine the price adjustment (if any) to be made to Contractor's monthly invoice as further detailed below. A price adjustment will be made to the monthly invoice for each month that Contractor exceeds the allowable number of non-compliance points, and Contractor acknowledges and agrees that the Authority shall have the right to withhold payment of the monthly fee in respect of Maintenance Work for the subsequent month in which the event

occurred (without incurring any interest charges) until such time as Contractor corrects or otherwise rectifies the non-conformance as provided herein. The parties acknowledge and agree that damages for such improper performance on the part of Contractor will be difficult to determine and that the amounts specified in this Section 17.3 have been agreed to by the parties as a reasonable estimate of the Authority's economic loss.

Total Non-Compliance Points (including escalation)	Percent Reduction in Monthly Invoice For Maintenance Work
0 – 20	0%
21 – 30	10%
31 – 40	20%
41 – 50	30%
51 – 60	40%
61 or more	50%

In all cases, Contractor shall identify the failure condition; take immediate action to remedy the condition; ensure that corrective action is taken to prevent future reoccurrence of the failure condition; and provide comprehensive documentation of all these aspects as part of a corrective action plan.

17.4   No Waiver; Reservation of Rights; Corrective Actions. Permitting Contractor to continue and finish the Toll Equipment Work or any part of the Toll Equipment Work after the expiration of the time allowed for completion or after any extension of time, shall not operate as a waiver of the rights of RMTA under this **Section 17** or any other provision of the Contract Documents.

Failure to meet a KPI does not relieve Contractor of the requirement to complete all activities associated with the KPI. For example, if Contractor fails to completely and accurately transmit the transactions to the VDOT Customer Service Center within the time required by the KPIs, Contractor shall still completely and accurately transmit such transactions.

Nothing contained in this Section 17 shall be construed as limiting the rights of RMTA to additionally recover from Contractor any or all payments which become due to RMTA for reasons other than untimely performance, such as improper performance, failure to perform or breach of contract in any other respect, including but not limited to defective workmanship, equipment or materials.

18. **Confidentiality**.

    18.1 Confidential Information.

    The parties acknowledge that in order to perform the Base Work and Maintenance Work called for in this Agreement, it may be necessary for RMTA to disclose to Contractor certain proprietary and/or confidential information such as toll data, toll or System records, security schemes or the like (collectively "*Confidential Information*"). Contractor will use any such Confidential Information solely for the Authority's benefit under this Agreement. Contractor shall use its best efforts to hold the Confidential Information in strictest confidence and will not disclose at any time, nor permit its officers or employees to disclose at any time (either during their respective employment by Contractor or thereafter), nor appropriate or use on its own behalf or on the behalf of others, any Confidential Information, without in each and every instance first obtaining the Authority's written consent thereto. Contractor shall restrict disclosure solely to those officers and/or employees of Contractor having a need to know and who have executed written confidentiality agreements with Contractor with provisions at least as restrictive as those expressed in this Agreement and which provisions clearly include the Confidential Information. Contractor shall not discuss nor disclose Confidential Information to any third Party, including but not limited to the Authority's consultants, contractors or vendors unless allowed to do so in writing by the Authority. Contractor shall not make or permit to be made by its officers and employees, copies, abstracts or summaries of any Confidential Information, including, but not limited to pictures, plans, data, notes and reports embodying any Confidential Information, except as required to perform the Toll Equipment Work under this Agreement. Upon the Authority's request, Contractor shall either return to the Authority or certify the destruction thereof, the Confidential Information and all such documents or other embodiments of any such Confidential Information.

    18.2 Exclusions. Confidential Information shall not include (a) information which was known to Contractor prior to the time of disclosure by the Authority, provided Contractor was not otherwise under obligation of confidentiality at the time of such other disclosure; (b) information that is disclosed to Contractor by a third party without violation of any rights of the Authority or the rights of any third party; (c) information which was publicly available at the time of disclosure by the Authority; and (d) information which becomes publicly available through no fault of Contractor. Contractor may disclose the Confidential Information if and to the extent that such disclosure is required by law or by court order, provided that Contractor provides the Authority a reasonable opportunity to review the disclosure before it is made and to interpose its own objection to the disclosure.

    18.3 Use Restriction. Contractor and its representatives shall use the confidential information solely for the benefit of the Authority in performing the Base Work

and Maintenance Work and shall not in any way use the Confidential Information to the detriment of RMTA.

18.4 Length of Confidentiality. Contractor's confidentiality obligations herein shall extend for a period of ten (10) years after the date each disclosure of Confidential Information is first made. However, if a court of competent jurisdiction determines that the maintenance of confidentiality for this period of time is not enforceable, then Contractor shall agree to maintain the confidentiality of the Confidential Information for the greatest amount of time as set forth in an applicable court order. The provisions of this Section 18.4 shall survive the termination of this Agreement.

18.5 Return of Confidential Information. Contractor shall return to RMTA any Confidential Information immediately on request but no later than upon the termination for whatever reason of this Agreement.

19. **Indemnification**.

19.1 General Indemnification. Contractor hereby waives, releases, relinquishes, discharges and agrees to indemnify, protect and save harmless the RMTA, and its officers, employees, representatives and members of the board (hereinafter collectively referred to as "*Indemnitees*"), of and from any and all claims, demands, liabilities, losses, costs or expenses for any loss or damage (including but not limited to reasonable attorney's fees and expert's fees) growing out of, or otherwise happening in connection with this Agreement, (i) due to any act or omission on the part of Contractor, its agents, employees, Subcontractors, or others working at the direction of Contractor or on its behalf, unless specifically directed in writing by RMTA to perform such act or omission; or (ii) due to any breach of this Agreement by Contractor; or (iii) due to the application or violation of any pertinent Federal, State or local law, rule or regulation by Contractor, its agents, employees, subcontractors, or others working at the direction of Contractor or on its behalf. The foregoing shall not apply in the situation giving rise to the claim results solely from the act or omission of the Indemnitees.

This indemnification extends to the successors and assigns of Contractor, and this indemnification and release survives the duration of this Agreement, the termination of this Agreement and the dissolution or, to the extent allowed by law, the bankruptcy of Contractor.

Without restricting the authority of counsel to RMTA, Contractor shall, at its expense, be entitled to participate to the fullest extent allowed by law and shall have the duty to participate in the defense of any suit against the Indemnitees. Neither Contractor nor its insurer shall be permitted to settle or compromise any claim, loss or damage asserted against the Indemnitees without the express approval of the Indemnitees, where required.

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19.2 <u>Intellectual Property Indemnification</u>. Contractor shall, at its cost and expense, indemnify and hold harmless RMTA from and against any claims, allegations or causes of action that any Equipment, or any other Toll Equipment Work supplied under the Contract Documents, or RMTA's use of the Toll Equipment or other Toll Equipment Work pursuant to the terms of the Contract Documents infringes any patent, copyright, utility model, industrial design, trade secret, confidential information, or any other proprietary right or Intellectual Property right of any third party. Contractor shall pay all costs of such defense, settlement, and any penalties, costs, damages and experts' and attorneys' fees awarded by a court or otherwise incurred by RMTA, provided that (a) RMTA promptly notifies Contractor of the claim but RMTA's failure to provide timely notice shall only relieve Contractor from its indemnification obligations if and to the extent such late notice prejudiced the defense or resulted in an actual increase in expense or loss to Contractor, and (b) Contractor notifies and agrees to request the RMTA to grant Contractor sole control of the defense and all related settlement negotiations, the Parties agreeing that the RMTA is under no obligation to grant such request.

19.2.1 If such claim has occurred, or in Contractor's opinion is likely to occur, RMTA agrees to permit Contractor, at its option, cost and expense, either to procure for RMTA the right to continue using the Toll Equipment or to replace or modify the same so that they become non infringing while meeting all of the Contract Requirements.

19.2.2 In case any Equipment is held to constitute an infringement of the patent rights or copyrights or other Intellectual Property rights of a third party and its use is enjoined (temporarily or permanently), Contractor, at Contractor's cost and expense, shall promptly (a) secure for RMTA and RMTA's representatives, agents, and designees the right to continue using the infringing item by suspension or removal of the injunction, or by procuring a perpetual, non-revocable, paid-up, royalty-free, assignable, non-exclusive license(s) to reproduce, publish, or otherwise use for RMTA's direct purposes; or (b) replace the infringing item with a non-infringing substitute that meets or exceeds the requirements of the Contract Documents; or (c) modify the infringing item so that it becomes non-infringing provided the resulting Equipment meets or exceeds the requirements of the Contract Documents. If the amount of time necessary to proceed with one of these options is deemed excessive by RMTA, RMTA may direct Contractor to select another option or risk default. Nothing in this provision shall be deemed to limit or condition RMTA's rights otherwise set forth in this Agreement, including termination. This intellectual property infringement provision shall not apply to any infringement or alleged infringement arising solely from RMTA (a) modifying or altering Equipment, except as consented to by Contractor, or (b) using the Toll Equipment in any way not permitted by the Contract Documents or otherwise as permitted by Contractor, unless such

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infringement or alleged infringement arose against the Toll Equipment wholly independent of the above two exceptions.

19.3   General.   Contractor's obligations under this **Section 19** are in addition to Contractor's insurance obligations.

20.   **Limitation of Liability**. In no event shall either Contractor or the RMTA be liable to the other for any special, indirect, incidental or consequential damages (including, but not limited to lost revenues, loss of transactions, profits and lost business opportunity), regardless of the legal theory under which such damages are sought, and even if the parties have been advised of the possibility of such damages.

21.   **Insurance**.

21.1   Insurance Certificates.   Contractor shall procure the insurance coverages identified below at Contractor's expense and shall furnish RMTA an insurance certificate listing the RMTA as the certificate holder and an endorsement listing RMTA as an additional insured.   Evidence of insurance coverages shall be provided on the form acceptable to RMTA.   The insurance certificate must provide the following:

21.1.1   Name and address of authorized agent
21.1.2   Name and address of insured
21.1.3   Name of insurance company(ies)
21.1.4   Description of policies
21.1.5   Policy Number(s)
21.1.6   Policy Period(s)
21.1.7   Limits of liability
21.1.8   Name and address of RMTA as certificate holder
21.1.9   Project Name and Number
21.1.10   Signature of authorized agent
21.1.11   Telephone number of authorized agent
21.1.12   Mandatory thirty Day notice of cancellation or non-renewal (except ten (10) Days for nonpayment).

21.2   Insurer Qualifications, Insurance Requirements. Each of the insurance coverages required below (i) shall be issued by a company licensed by the Insurance Commissioner to transact the business of insurance in the Commonwealth of Virginia for the applicable line of insurance, and (ii) shall be an insurer (or, for qualified self-insureds or group self-insureds, a specific excess insurer providing statutory limits) with an A.M. Best Policyholders Rating of "A-" or better and with a financial size rating of Class V or larger. Each such policy shall contain the following provisions:

21.2.1   The insurance company agrees that the policy shall not be canceled or allowed to lapse or allowed to expire until thirty (30) Days after the RMTA has received written notice thereof, as evidenced by return

receipt of certified mail or statutory mail, or until such time as other insurance coverage providing protection equal to protection called for in this Agreement shall have been received, accepted and acknowledged by the RMTA. Such notice shall be valid only as to the Project as shall have been designated by Project Number and Name in such notice. Contractor shall provide written notice of any changes to the policy to the RMTA within three (3) Business Days of Contractor's receipt of notice of any changes or proposed changes from the insurance company.

21.2.2 The policy shall not be subject to invalidation as to any insured by reason of any act or omission of another insured or any of its officers, employees, agents or other representatives ("*Separation of Insureds*").

21.2.3 All deductibles shall be paid for by Contractor.

21.2.4 Self-insured retention, except for qualified self-insurers or group self-insurers, in any policy shall not exceed $250,000.00.

21.3 <u>Required Insurance Coverages</u>. Contractor also agrees to purchase insurance and have the authorized agent state on the insurance certificate that Contractor has purchased the following types of insurance coverages, consistent with the policies and requirements of applicable Virginia law. The minimum required coverages and liability limits are as follows:

21.3.1 Workers' Compensation Insurance. Contractor agrees to provide at a minimum Workers' Compensation coverage in accordance with statutory limits. A group insurer must submit a certificate of authority from the Insurance Commissioner approving the group insurance plan. A self-insurer must submit a certificate from the Virginia Workers' Compensation Commission stating Contractor qualifies to pay its own workers' compensation claims. Contractor shall require all subcontractors performing work under this Agreement to obtain an insurance certificate showing proof of Workers' Compensation Coverage and shall submit a certificate on the letterhead of Contractor in the following language:

This is to certify that all subcontractors performing work on this Project are covered by their own workers' compensation insurance or are covered by Contractor's workers' compensation insurance.

21.3.2 Employers' Liability Insurance. Contractor shall also maintain Employer's Liability Insurance Coverage with limits of at least:

<u>Coverage</u>	<u>Limits</u>
Bodily Injury by Accident	$1,000,000 each accident; and
Bodily Injury by Disease	$1,000,000 each employee.

Contractor shall require all subcontractors performing work under this Agreement to obtain an insurance certificate showing proof of Employers Liability Insurance Coverage and shall submit a certificate on the letterhead of Contractor in the following language:

This is to certify that all subcontractors performing work on this Project are covered by their own Employers Liability Insurance Coverage or are covered by Contractor's Employers Liability Insurance Coverage.

21.3.3　　Commercial General Liability Insurance. Contractor shall provide Commercial General Liability Insurance (2001 ISO Occurrence Form or equivalent) that shall include, but need not be limited to, coverage for bodily injury and property damage arising from premises and operations liability, products and completed operations liability, blasting and explosion, collapse of structures, underground damage, personal injury liability and contractual liability. The CGL policy must include separate aggregate limits per Project and shall provide at a minimum the following limits:

<u>Coverage</u>	<u>Limit</u>
Premises and Operations	$ 1,000,000.00 per Occurrence
Products and Completed Operations	$ 1,000,000.00 per Occurrence
Personal Injury	$ 1,000,000.00 per Occurrence
Contractual	$ 1,000,000.00 per Occurrence
General Aggregate	$ 2,000,000.00 per Project

Additional Requirements for Commercial General Liability Insurance are shown below.

21.3.4　　Commercial Business Automobile Liability Insurance. Contractor shall provide Commercial Business Automobile Liability Insurance that shall include coverage for bodily injury and property damage arising from the operation of any owned, non-owned, or hired automobile.   The Commercial Business Automobile Liability Insurance Policy shall provide not less than $1,000,000 Combined Single Limits for each occurrence.

21.3.5　　Commercial Umbrella Liability Insurance. Contractor shall provide a Commercial Umbrella Liability Insurance to provide excess coverage above the Commercial General Liability, Commercial Business Automobile Liability and the Workers' Compensation and Employers'

Liability to satisfy the minimum limits set forth herein. The umbrella coverage shall follow form with the Umbrella limits required as follows:

$2,000,000 per Occurrence/$10,000,000 Aggregate

21.3.6 The insurance provided in **Sections 21.3.3, 21.3.4, and 21.3.5** shall also meet the following additional requirements:

21.3.6.1 The policy shall name as additional insureds the officers, members, and employees of RMTA.

21.3.6.2 The policy must be on an "occurrence" basis.

21.3.7 Disposition of Insurance Documents. One original certificate of insurance with all endorsements attached must be deposited with RMTA for each insurance policy required.

21.4 Termination of Obligation to Insure. Unless otherwise expressly provided to the contrary, the obligation to insure as provided herein shall not terminate until the expiration or other termination of this Agreement.

21.5 Failure of Insurers. Contractor is responsible for any delay resulting from the failure of his insurance carriers to furnish proof of proper coverage in the prescribed form.

21.6 Ongoing Coverage. Contractor is responsible for tracking insurance coverages for itself and its subcontractors, for ensuring that coverages remain in force throughout the duration of this Agreement, and for demonstrating to RMTA ongoing compliance with this **Section 21**.

21.7 General. Contractor's obligations under this **Section 21** are in addition to Contractor's obligations under **Section 19 (Indemnification)**.

22. **Non-exclusivity**. This Agreement is entered into solely for the convenience of RMTA, and in no way precludes RMTA from obtaining like goods or services from other suppliers. Further, RMTA, at its discretion, may order Base Work or Maintenance Work as it deems necessary as provided herein and in conformity with **Attachment C (Pricing and Payment Schedules)** for any quantity desired. This Agreement is an optional-use contract that neither financially binds the RMTA nor otherwise obligates RMTA to purchase any Base Work or Maintenance Work hereunder.

23. **Spare Parts**. This Agreement includes the initial quantities of spare parts required for the operation of the System during the term of this Agreement, and costs for the replacement of spare parts during the term of this Agreement shall be the responsibility of Contractor. Thirty (30) days prior to placing the System in revenue collection,

Contractor shall purchase and maintain on behalf of the Authority an initial stock of spare parts and equipment for the System, and Contractor shall thereafter maintain a sufficient level of spare parts required to meet all performance requirements under this Agreement. At the end of the maintenance term, all spare parts inventory shall be turned over to RMTA at one hundred percent (100%) inventory level, unless otherwise specified by RMTA Contractor shall identify (via the MOMS) the warranty status for each piece of hardware and warranty period remaining, if applicable. Unless otherwise specified by RMTA, spare parts shall be purchased on behalf of RMTA, and Contractor shall purchase all spares on account of RMTA in a manner to ensure that RMTA obtains the benefit of all warranties associated with such spares.

Contractor shall be responsible for the maintenance of an adequate spare parts inventory during the term of this Agreement and shall monitor and identify the existing spare parts inventory, order spare parts as required, and propose the quantity needed to maintain the required performance.   Contractor shall, on a quarterly basis, update and recommend a spare part quantity to be maintained in order to support the System functionality and operational readiness.   Contractor shall keep accurate records of all parts entering and leaving inventory including but not limited to: time and date part was dispensed, and the location within the RMTA Expressway System where the part was dispatched and used. Any spare parts that are lost or damaged due to the negligence, intentional act, or omission of Contractor or its employees, subcontractors, agents, or invitees shall be replaced by Contractor at its sole cost.

Contractor shall be responsible for the inventory of all spare parts and shall be insured in this regard as set forth in this Agreement. Contractor will maintain and track the inventory of all spares and consumables for the Authority and shall provide the Authority with a list itemizing all spares and consumables in the Authority's inventory as reasonably requested, but not more frequently than once a month. All of the Authority's spares and consumables shall be maintained by Contractor free and clear of all liens and encumbrances of any kind whatsoever at locations to be agreed upon between the Authority and Contractor, which shall provide safeguards against theft, damage, or loss of the spare parts. The Authority shall have the right to inspect the spares and consumables inventory at any time and shall give Contractor written notice any time the Authority removes any of its spares or consumables. Contractor will provide no less frequently than annually a list of recommended quantities of spare parts. Contractor shall be responsible for providing all miscellaneous repair parts and materials costing less than $15.00 per item, at its own expense, which shall include, but not be limited to, fuses, touch-up paint, screws and nuts, wire, connectors, cables, labels, and insulating tape, as required, to comply with the requirements of these specifications.   Contractor will provide normal shop consumables (*e.g.*, solder, lubricants, cleaning rags, etc.) and spares costing less than $15 per item, excluding toll system consumables (*e.g.*, magnetic media, batteries, receipt printer paper, light bulbs, etc.), at no additional cost to the Authority.

Contractor shall also be responsible for tracking of all warranty replacement for Contractor provided equipment through Returned Material Authorization (RMA) process. If the replaced part is under warranty, the part shall be immediately replaced with a new

part. If the replaced part is out of warranty, Contractor shall make every effort to repair the replaced item to a usable status and place the part back into spares inventory.

Contractor's failure to purchase or replenish the spare parts or consumables to levels necessary to meet the performance requirements for the System can constitute an event of default and will not relieve Contractor from meeting all required performance requirements or any associated liquidated or actual damages resulting from the non-performance.

RMTA may elect to assume responsibility at any time for storage of spare parts, and Contractor shall deliver all spare parts to RMTA for storage after receipt of reasonable notice.

24. **RESERVED**.

25. **Dispute Resolution**. In the event of any dispute whatsoever arising out of or relating to the Contract Documents or the Toll Equipment Work, the disputing Party must furnish a written notice to the other Party, setting forth in detail the dispute. Such notice must be addressed to RMTA's Director of Operations or Contractor's Project Manager, as applicable. Within five (5) Days after the receipt of the notice by the receiving Party, the Director of Operations and the Project Manager shall meet in RMTA's offices to attempt to resolve the dispute. If the Director of Operations and the Project Manager cannot resolve the dispute then, within five (5) Days after the date of written notice by either individual to the General Manager of RMTA and Executive Vice President of Contractor, the General Manager of RMTA and the Executive Vice President shall meet in RMTA's offices to attempt to resolve the dispute. If the General Manager of RMTA and the Executive Vice President cannot resolve the dispute or otherwise agree to extend the time within which to attempt to resolve the dispute, then either Party may pursue those remedies only as allowed under this Agreement.

26. **Adequate Assurances**. If RMTA become insecure about the prospect of Contractor being able to comply with the terms of this Agreement or that the Toll Equipment proposed by Contractor under this Agreement will not perform as set forth in the Contract Documents, then where there are reasonable grounds for such insecurity, the RMTA shall have a right to demand and receive from Contractor adequate assurance of performance. In such an event, Contractor shall respond to RMTA's demand for adequate assurances no later than five (5) Business Days from Contractor's receipt of RMTA's demand.

27. **Event of Default; Damages/Remedies**.

    27.1 <u>Event of Default</u>. The following shall constitute an Event of Default on the part of Contractor:

        27.1.1 Contractor withheld, disrupted or delayed Toll Equipment Work or any Equipment due to non-payment by RMTA, as a result of the

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procedure set forth in **Section 7.12 (Disputed Invoices)** and the continuance thereof for a period of two (2) Business Days after notice is given to Contractor by RMTA;

27.1.2   Contractor has failed to deliver the Toll Equipment Work or a component thereof on a timely basis, except to the extent of an excusable delay in accordance with **Section 16 (Delays and Extension of Time)** and the continuance thereof for a period of five (5) Days after notice is given to Contractor by RMTA;

27.1.3   The Toll Equipment Work or any component thereof has failed to meet the criteria set forth in the Contract Documents and the continuance thereof for a period of five (5) Days after notice is given to Contractor by RMTA;

27.1.4   Contractor failed to remedy Toll Equipment Work that does not comply with the performance standards or the terms of the Contract Documents and the continuance thereof for a period of five (5) Business Days after notice is given to Contractor by RMTA, or the failure to remedy a "Pervasive Defect" in accordance with the resolution plan as provided in Section 6.16 hereof for a period of five (5) Business Days after notice is given to Contractor by RMTA;

27.1.5   Any portion of the Toll Equipment Work does not meet the performance standards listed in the RFP, and the performance measurement will be based upon controlled test vehicles as determined by RMTA in a live lane environment so that the confidence level meets or exceeds the confidence level indicated by the results of the testing required in the RFP, and the continuance thereof for a period of fifteen (15) days after written notice to Contractor;

27.1.6   Contractor has failed to maintain the contract bonds, as required by **Section 6.15**, and insurance policies and coverages or fails to provide proof of insurance or copies of insurance policies, as required by **Section 21 (Insurance)** and the continuance thereof for a period of ten (10) Business Days after notice is given to Contractor by RMTA;

27.1.7   Contractor becomes insolvent, or has assigned the proceeds of this Agreement for the benefit of Contractor's creditors (except any assignment of proceeds as collateral for any loan), or Contractor has taken advantage of any insolvency statute or debtor/creditor law or Contractor's property or affairs have voluntarily been put in the hands of a receiver; or any case, proceeding or other action against Contractor is commenced in bankruptcy, or seeking reorganization, liquidation or any relief under any bankruptcy, insolvency, reorganization, liquidation, dissolution or other similar act or law of

any jurisdiction, which case, proceeding or other action remains undismissed, undischarged or unbonded for a period of thirty (30) Days;

27.1.8   Contractor failed to provide "adequate assurances" within five (5) Business Days of RMTA's notice, when, in the opinion of RMTA, reasonable grounds for uncertainty exist or a material adverse change or effect has occurred with respect to Contractor's ability to perform any of its obligations under this Agreement;

27.1.9   The suspension or revocation of any license, permit, or registration necessary for the performance of Contractor's obligations under this Agreement and the continuance thereof for a period of ten (10) Days after notice is given to Contractor by RMTA;

27.1.10   Contractor suspended or failed to proceed with any part of the Toll Equipment Work and the continuance thereof for a period of seven (7) Days after notice is given to Contractor by RMTA;

27.1.11   The default in the performance or observance of any of Contractor's other obligations under this Agreement or the Contract Documents and the continuance thereof for a period of ten (10) Days after notice is given to Contractor by RMTA.

27.1.12   Contractor shall have made any material misrepresentation or omission in any written materials furnished in connection with any of the Contract Documents, including but not limited to its proposal, acceptance of or agreement with RFP or contract requirements, best and final offer, or its performance hereunder.

27.2   RMTA Damages/Remedies. Upon the occurrence of an Event of Default, RMTA may, in addition to and without prejudice to all other contractual remedies and/or remedies allowed at law or in equity, proceed to take any or all of the following actions:

27.2.1   Withhold any money then due and/or thereafter due to Contractor;

27.2.2   Perform or cause to be performed for the account of Contractor any contractual covenant in the performance of which Contractor is in default or make any payment for which Contractor is in default. Contractor shall pay to RMTA upon demand any amount paid or incurred by RMTA in the performance of such covenant. Any amounts which have been paid or incurred by reason of failure of Contractor to comply with any covenant or provision of this Agreement shall bear interest at the Default Rate, which shall be defined as the Prime Rate

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plus five (5) percent (but in no case higher than the highest rate permitted by law) from the date of payment by RMTA until such amount is fully paid by Contractor;

27.2.3   RMTA shall have the right to immediately find Contractor in default and/or take any other action contemplated in **Section 29.2 (Transition)**, and/or procure other Toll Equipment Work from third parties and charge Contractor for and Contractor shall be liable to RMTA for the expense of such procurement, Toll Equipment Work and any other costs and expenses, including lost profits and revenues, incurred by RMTA as a result of the termination; and

27.2.4   Obtain the Toll Equipment Work, or a portion thereof, from a third party under substantially similar terms of this Agreement, and recover from Contractor all additional costs and expenses paid or incurred by RMTA as a result of the Event of Default, plus all additional costs paid or incurred by RMTA to obtain the replacement Toll Equipment Work as set forth in this Section.

27.2.5   Exercise any other rights and remedies available to RMTA under this Agreement, including the attachments hereto, or the Contract Documents, or available to RMTA at law or in equity, based on any applicable theory, including but not limited to the exercise of any rights as an intended third party beneficiary and the recovery of any and all damages of any kind to the extent provided or permitted by applicable law.

28.   **Cover**. If Contractor fails to timely perform any or all of its obligations under this Agreement, RMTA may, in addition to all other contractual, legal or equitable remedies (but not in addition to liquidated damages set forth in **Section 17**), proceed to take either or both of the following actions after five days written notice to Contractor:

28.1   Withhold Payment. Withhold any money then due and/or thereafter due to Contractor; and

28.2   Replacements. Obtain replacements identical or substantially similar to the Toll Equipment and/or Maintenance Work and support services, or a portion of either thereof, under substantially similar terms of this Agreement, from a third party, and recover from Contractor all additional costs and expenses paid or incurred by RMTA as a direct result of Contractor's failure to perform under this Agreement, plus all additional costs paid or incurred by RMTA to obtain the replacements as set forth in this **Section 28.2**.

29. **Cooperation, Transition of Equipment, and End of Contract Responsibilities**.

29.1 <u>Cooperation</u>. In the event that RMTA enters into any agreement at any time with any other vendor(s) for additional work related to Equipment, Contractor agrees to cooperate fully with such other vendors in order to facilitate the performance of work and/or provision of deliverables by such other vendors and to refrain from any activity which would interfere with performance of work and/or provision of deliverables by such other vendor.

29.2 <u>Transition</u>. Upon expiration or earlier termination of this Agreement or any Equipment provided hereunder, Contractor shall accomplish a complete transition of the Toll Equipment Work from Contractor to RMTA, or to any replacement provider designated by RMTA, without any interruption of, or adverse impact on the Toll Equipment Work or any other work provided by third parties. Contractor shall cooperate fully with RMTA or such replacement provider and promptly take all steps required to assist in effecting a complete transition. All Equipment related to such transition shall be performed at no additional cost beyond what would be paid for the Toll Equipment Work hereunder.

29.3 <u>End of Contract</u>. Contractor shall perform the end of Contract responsibilities as specified in the Contract Documents or as otherwise specified by RMTA upon the expiration or earlier termination of this Agreement.

29.4 <u>Contractor Obligations</u>. Contractor shall, without limiting its obligations pursuant to any other clause or condition in this Agreement:

(i) subject to the terms of any third-party contracts, procure at no charge to RMTA any third-party authorizations necessary to grant RMTA the use and benefit of any third-party contracts between Contractor and third-party contractors used to provide Toll Equipment Work, pending their assignment to RMTA.

(ii) convey to RMTA all RMTA assets need for system maintenance in Contractor's possession. If applicable, at the election of RMTA, Contractor shall convey to RMTA from among those assets then held by Contractor for the provision of Toll Equipment Work to RMTA such assets as RMTA may select, at a price consisting of the net book value. Contractor shall promptly remove from RMTA premises any Contractor asset that RMTA, or its designee, chooses not to purchase.

(iii) at its expense, shall convey or assign to RMTA or its designee such leases, licenses and other contracts used by Contractor, RMTA, or any other person in connection with the Toll Equipment Work, as RMTA may select. Contractor's obligation described herein, shall include Contractor's performance of all obligations under such leases, licenses and other contracts to be performed by it with respect to periods prior to the date of

conveyance or assignment and Contractor shall indemnity, defend and hold harmless RMTA for any losses or liability resulting from any claim that Contractor did not perform any such obligations.

(iv)   deliver to RMTA or its designee, at RMTA's request, all documentation and data related to RMTA, including RMTA's data, held by Contractor, and upon Approval by RMTA, Contractor shall destroy all copies thereof not turned over to RMTA, all at no charge to RMTA. Notwithstanding the foregoing, Contractor may retain one (1) copy of the documentation and data, excluding RMTA data, for archival purposes or warranty support.

29.5   Failure to Comply. The Parties acknowledge and understand that Contractor's failure to comply with the terms and conditions as stated hereinabove shall adversely affect RMTA and result in monetary loss to RMTA. RMTA shall assess, audit, and certify to Contractor monetary losses resulting from Contractor's failure to comply with the provisions of this **Section 29**. RMTA's determination as to the amount of the monetary loss suffered shall be conclusive and Contractor shall compensate RMTA for such loss within thirty (30) Days of such a determination.

30.   **Termination**.

30.1   Termination for Cause. Upon an Event of Default, RMTA may, in its sole discretion, terminate this Agreement in whole or in part. Termination shall take effect on the date set forth in RMTA's notice to Contractor. Upon such termination, RMTA will have the right to appropriate or use any or all materials as RMTA determines. Upon such termination RMTA shall not be required to pay Contractor any amounts for Toll Equipment Work performed prior to the date of termination for which payment may be due and owing but not yet paid ("*Remaining Payment*"). In the event RMTA's expenses incurred or anticipated to be incurred as a result of Contractor's breach are less than the Remaining Payment, RMTA shall remit such differential to Contractor. In the event RMTA's expenses incurred or anticipated to be incurred as a result of Contractor's breach exceed the Remaining Payment, including any costs of RMTA incurred by any delay (or from any reason attributable to the delay, including the payment of any penalties by RMTA to any third party under separate agreement) then Contractor shall within five (5) Days written notice from RMTA, make payment of the differential to RMTA. In addition to the rights and remedies in this **Section 30.1**, RMTA shall have all other rights and remedies against Contractor which are available at law or in equity. Contractor acknowledges that the remedy set forth in this **Section 30.1** is Contractor's sole and exclusive remedy against RMTA for termination for cause and Contractor hereby waives all other rights and remedies it may have against RMTA under the Contract Documents, at law or in equity.

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30.2 Termination for Convenience. RMTA may terminate this Agreement upon sixty (60) calendar days written notice, which shall commence upon the date of such notice. In the event of a termination for convenience, RMTA shall only pay Contractor for Toll Equipment Work performed through the termination date. As used in the previous sentence, "performed" shall mean work that has been approved for payment, including with respect to any milestone basis for payment. RMTA shall not be responsible for any other costs, fees and expenses of any nature whatsoever, including but not limited to administrative fees, legal fees, costs to set up or shut down operations at the project site, salary, or any other cost or expense, whether direct or indirect, whether foreseen or unforeseen. Contractor acknowledges that the remedy set forth in this **Section 30.2** is Contractor's sole and exclusive remedy against RMTA for termination for convenience and Contractor hereby waives all other rights and remedies it may have against RMTA under the Contract Documents, at law or in equity.

31. **Conflicts of Interest**. Contractor represents and warrants that it, its principals, its employees, and all others in close association with it, have no conflict of interest or of time, directly or indirectly, that would prevent timely performance of the Toll Equipment in a manner that is free of appearance or fact of impropriety. Contractor promises to allow no such conflict to arise and promises to disclose such a conflict in the event that, nevertheless, one develops.

32. **Records Retention and Audit Rights**. Contractor shall, and shall cause each of its subcontractors to, maintain accurate books, records, documents and other evidence concerning Contractor's performance of Toll Equipment Work under this Agreement (hereinafter referred to as the "*Records*"). Contractor agrees to make available, at all reasonable times during which this Agreement is in effect the Records for inspection or audit by any authorized representative of RMTA. Within no more than five (5) Days after the termination of this Agreement for any reason, copies of all Records shall be given by Contractor to RMTA. Records that relate to appeals, litigation, or the settlements of claims arising out of the performance of this Agreement, or costs and expenses of any such agreement as to which exception has been taken by RMTA shall be retained by Contractor until such appeals, litigation, claims or exceptions have been disposed.

In addition to audit obligations as set forth in the RFP Contractor shall, and shall cause each of its subcontractors, agents and assigns to, maintain accurate books, records, documents and other evidence concerning Contractor's performance of Toll Equipment Work under this Agreement (hereinafter referred to as the "*Records*"). Records shall include all information, communications and data, whether in writing or stored on a computer, computer disks, microfilm, writings, working papers, drafts, computer printouts, notes, charts or any other data compilations, books of account, photographs, videotapes and audiotapes supporting documents, any other papers or preserved data in whatever form, related to this Agreement or Contractor's performance of the Toll Equipment Work determined necessary or desirable by RMTA for any purpose. Contractor agrees to make available, at all reasonable times, the Records for inspection or audit by any authorized representative of RMTA. Within no more than five (5) Days

after the termination of this Agreement for any reason, copies of all Records shall be given by Contractor to RMTA. Records that relate to appeals, litigation, or the settlements of claims arising out of the performance of this Agreement, or costs and expenses of any such agreement as to which exception has been taken by the Commonwealth Auditor or any of his or her duly authorized representatives, shall be retained by Contractor until such appeals, litigation, claims or exceptions have been disposed.

Notwithstanding the foregoing paragraphs in this Section 32, any such audit and examination of Records is limited to Toll Equipment Work under this Agreement, including subsequent Support Work, to the extent same is incorporated into this Agreement. Ownership in terms of work for hire under this Agreement will not apply to Contractor proprietary and confidential information incidental to contract management and administration, and are not deemed deliverables or work for hire under this Agreement.

33.   **Attachments.** The following Attachments are incorporated by reference into and made a part of the Contract Documents:

> Attachment A - Request for Proposals (and addenda thereto)
> Attachment B - Contractor's Proposal

The following Attachments are attached hereto and incorporated into the Contract Documents:

> Attachment C – Pricing and Payment Schedule(s)
> Attachment D – Project Schedule(s)

34.   **Cooperative Purchasing**. As provided in the RFP and pursuant to Va. Code § 2.2-4304, Contractor agrees that, upon RMTA's written approval, other tolling entities in the Commonwealth, including but not limited to public and private members of the Virginia Toll Facilities group that operate toll roads in the Commonwealth of Virginia and other third parties (individually, "*Third Party*" and collectively, "*Third Parties*") may purchase or contract for any good or item of toll equipment work or service under this Agreement. In such a case, Contractor shall look solely to the Third Party placing such order for all obligations and liabilities due to Contractor under the Contract Documents for such purchase. By way of example and not limitation, RMTA shall have no liability whatsoever to Contractor for payment for such ordered good or item of toll equipment work or service. The specific pricing, contract terms and conditions and the like shall be as mutually agreed upon between Contractor and any such Third Party, based upon the scope, timing, and other factors related to any contemplated transaction.

35. **Miscellaneous Provisions**.

35.1. <u>Compliance with Laws</u>. Contractor shall perform its obligations hereunder in accordance with all applicable federal, state, and local government laws, rules, regulations, orders and approvals including, but not limited, to procedures and requirements relating to labor standards, equal employment opportunity, nondiscrimination, compliance with the Americans with Disabilities Act, anti-solicitation, and auditing and reporting provisions, now or hereafter in effect, and any rules required by any federal grant funding payment by RMTA. Any changes to applicable laws, rules, or regulations that are enacted after contract award may be the subject of a Change Order only if a change to applicable laws, rules, or regulations results in an actual and direct increase in cost to Contractor to comply with such changes. In such an event, the increased cost shall reflect the unit prices set forth in Contractor's Proposal, and if a unit price is not included in Contractor's Proposal, then the Change Order shall reflect an increase in price of Contractor's actual cost plus a markup as RMTA may reasonably approve.

35.2 <u>Parties Bound</u>. This Agreement will bind the respective heirs, executors, administrators, legal representatives, successors, and assigns of each Party.

35.3 <u>Time of the Essence; Force Majeure</u>. Time is of the Essence in the performance of this Agreement. However, neither Party shall be liable to the other Party for any delay or failure of performance due to fire, act of war, hostile foreign action, nuclear explosion, riot, strikes or failures or refusals to perform under subcontracts, civil insurrection, earthquake, hurricane, tornado, or other catastrophic natural event or act of God (collectively, "*Force Majeure*"). Contractor's exclusive remedies for Force Majeure events are set forth in **Section 16 (Delays and Extension of Time)**.

35.4 <u>Non-disparagement</u>. Each Party agrees not to make any statement, written or oral, to any third party which disparages or criticizes the other Party or the other Party's respective officers, directors, agents or management and business practices, in each case in connection with the performance or administration of the Toll Equipment Work, this Agreement, any other work/relationship between the other Parties under separate agreement, or any matter related thereto. The provisions of this **Section 35.4** shall not apply to any truthful statement required to be made by either Party, or such Party's officers, directors or agents, as the case may be, in any legal proceeding or governmental or regulatory investigation or to any internal discussions or communications between the Parties, or if the Authority is contacted for reference or similar information by a party to whom Contractor has applied for or submitted a proposal for toll work.

35.5 <u>Federal Intellectual Property Bankruptcy Protection Act</u>. RMTA shall be entitled to all rights and benefits of the Federal Intellectual Property Bankruptcy Protection Act, Public Law 100-506, codified at 11 § U.S.C. 355(n) and any amendments thereto.

35.6   Governing Law. This Agreement is a Virginia agreement made under the laws of the Commonwealth. It will be enforced according to Virginia law without regard to its conflict of laws rules or any other rules directing referral to foreign law or forums. Any action related to this Agreement in any way shall be brought exclusively in the Circuit Court of the City of Richmond, Virginia, or the Federal District Court of the Eastern District of Virginia, Richmond Division, and each Party hereby consents to the jurisdiction and venue of such courts and the appropriate appellate courts therefrom in any such action and irrevocably waives, to the fullest extent permitted by law, any objection that it may now or hereafter have to the personal jurisdiction and venue of such court and to any claim of inconvenient forum. Each Party hereby agrees to execute an acknowledgment of service of process at the request of the other Party in any litigation related to this agreement. In the event that a Party does not provide an acknowledgment of service as agreed, each Party consents to service of process at that Party's address set forth in **Section 35.8 (Notices)**.

35.7   Notices. All notices, notifications, Approvals, Acceptances, requests, permission, waivers or other communications (excluding invoices that will be handled as set forth in **Section 7 (Payment Terms)** hereunder shall be in writing and transmitted via hand delivery, overnight courier, or certified mail to the Parties at the respective addresses set forth below. Invoices may also be sent by U.S. Mail, postage prepaid. Notices will be deemed to have been given when received, unless otherwise noted in this Agreement. If a Party refuses to accept delivery or fails to take delivery, notice shall be deemed given on the day delivery is first attempted. Notice may also be given by email, provided a hard copy of the notice is also transmitted via hand delivery, overnight courier, or certified mail to the Parties at the respective addresses set forth below.

>   *For RMTA:*
>
>   919 East Main Street, Suite 600
>   Richmond, Virginia   23219
>   Attention: [_____]
>
>   *For Contractor:*
>
>   _____
>   _____
>   _____
>   Attention: _____

35.8   Compliance with Laws; Taxes. Contractor will pay all taxes lawfully imposed upon it that may arise with respect to this Agreement.

35.9   Publicity. Contractor shall not communicate with the media or press concerning this Agreement or the Toll Equipment Work, or issue a press release or otherwise publicize the Toll Equipment Work or this Agreement without the prior written permission of the Authority.

35.10   Reserved.

35.11   Remedies Cumulative. The rights and remedies of RMTA under this Agreement are cumulative of one another and with those otherwise provided by law or in equity.

35.12   Waiver and Severability. The waiver by RMTA of a breach of any provision of this Agreement shall not be deemed to be a waiver of such provision on any subsequent breach of the same or any other provision of this Agreement. Any such waiver must be in writing in order to be effective, and no such waiver shall establish a course of performance between the Parties contradictory to the terms hereof. All provisions of this Agreement are severable, and the unenforceability or invalidity of any of the provisions will not affect the validity or enforceability of the remaining provisions. The remaining provisions will be construed so as to carry out the full intention of the Parties.

35.13   No Third Party Beneficiaries.   It is specifically agreed between the parties executing the Agreement that it is not intended by any of the provisions of any part of the Agreement to create in the public or any member thereof, a third party beneficiary hereunder, or to authorize anyone not a party to the Agreement to maintain a suit for personal injuries or property damage or other cause of action pursuant to the terms or provisions of the Agreement.

Nothing contained in the Contract Documents shall be construed as conferring upon or giving to any person, other than the Parties hereto, any rights or benefits under or by reason of this Agreement.

35.14   Interpretation.

35.14.1   The captions in this Agreement are solely for convenience, and will not affect the interpretation of any terms of this Agreement.

35.14.2   Wherever the word "*including*" "*includes*" or "*include*" is used in this Agreement, it shall be deemed to be followed by the words "*without limitation*."

35.14.3   The appropriate reasonable and professional standards as "*in the opinion of*" or "*satisfaction of*" or "*in the judgment of*" mean "the generally accepted practices in the toll systems industry," and that RMTA's approval or acceptance of such practices and the items supplied and work performed hereunder shall not be unreasonably

withheld, hindered, or delayed, or require performance beyond the specifications and scope of work.

35.14.4 Any provision or statement containing the words "*must*", "*shall*", or "*will*" is and shall be interpreted by the Parties as mandatory.

35.15 <u>Counterparts</u>. The Parties may execute this Agreement in counterparts.

35.16 <u>Construction of Contract</u>. In the event this Agreement must be interpreted by a court of competent jurisdiction as defined in **Section 35.6 (Governing Law)**, the Parties expressly agree that this is a negotiated contract that will not be construed against one Party over the other because such Party drafted this Agreement.

35.17 <u>Survival</u>. In addition to those provisions, which by their terms would naturally survive termination of this Agreement, **Sections 7 (Payment Terms), 9 (Warranties), 12.4 (Risk of Loss), 15 (Delivery of Software), 27 (Liquidated Damages), 18 (Confidentiality), 19 (Indemnification), 20 (Limitation of Liability of RMTA), 21 (Insurance), 27 (Event of Default; Damages/Remedies), 28 (Cover), 29 (Cooperation, Transition of Toll Equipment Work and End of Contract Responsibilities), 30 (Termination), 31 (Conflicts of Interest), 32 (Records Retention and Audit Rights,** and **35 (Miscellaneous Provisions** shall survive the termination for whatever reason of this Agreement.

35.18 <u>Non-exclusivity</u>. This Agreement is entered into solely for the convenience of RMTA, and in no way precludes RMTA from obtaining like goods or services from other vendors at RMTA's sole discretion.

35.19 <u>Entire Contract; Amendment</u>. This Agreement contains the entire agreement between the Parties with respect to its subject matter and supersedes all other prior and contemporaneous contracts and understandings between the Parties, whether oral or written. RMTA shall not be bound by any terms and conditions included in any packaging, Invoice, catalog, brochure, technical data sheet, or other document prepared by Contractor which attempts to impose any condition in variance with or in addition to the terms and conditions contained herein, and any such terms and conditions shall be automatically null and void. No amendment to this Agreement shall be valid unless made in writing and signed by both Parties.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed effective as of the day and year first above mentioned.

RICHMOND METROPOLITAN TRANSPORTATION AUTHORITY, a political subdivision of the Commonwealth of Virginia

By:_____
      Chief Executive Officer

_____**,** [doing business as _____], a _____ [corporation] [company]

By:_____

Its:_____

REQUEST FOR PROPOSALS

[INCORPORATED BY REFERENCE]

<div align="right"><u>ATTACHMENT B</u></div>

<div align="center"><u>CONTRACTOR'S PROPOSAL</u></div>

<div align="center"><i>[INCORPORATED BY REFERENCE;
INCLUDES BEST AND FINAL OFFER]</i></div>

<div align="right">**ATTACHMENT C**</div>

PRICING AND PAYMENT SCHEDULES

[To come]

WORK SCHEDULES

[To come]

FORM OF BOND(S)

[To come]

E - 1

Exhibit I: Other Authority Forms

Non-Collusion Affidavit (NC-1)
Proposal Bond (PB-1)
Proposer Inquiry (PI-1)
Receipt of Addenda (RA-1)
SWaM Participation (DBE-1)

EXHIBIT-I-1

RICHMOND METROPOLITAN TRANSPORTATION AUTHORITY

_____

RICHMOND EXPRESSWAY SYSTEM

RMTA TOLL SYSTEM & SERVICES CONTRACT NO. TSS2017

****

<u>NON-COLLUSION AFFIDAVIT</u>

STATE OF   _____)
) ss.
COUNTY OF _____)

    I, _____, of the City of _____, County of _____ and State of _____, being of full age and duly sworn according to law on my oath depose and say:

    That I am _____(Title) of _____, the Vendor making the Proposal submitted to the Richmond Metropolitan Transportation Authority, on the _____ day of _____, 20___, for Toll System & Services Contract No. TSS2017 in connection with the Richmond Expressway System; that I executed the said Proposal with full authority to do so;

    The said Proposal has not, directly or indirectly, entered into any combination or arrangement with any person, firm or corporation or entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free, competitive bidding or which would increase the cost of construction or maintenance in connection with the said Contract; that no person or selling agency has been employed or retained to solicit or secure the said Contract upon an agreement or understanding for a commission, percentage, brokerage or contingent fee, except bona fide full-time employees;

And that said Vendor is or has been a member of the following highway contractors' association during the preceding twelve months:

        Name of Association   Location of Principal Office

_____   _____

_____   _____

_____   _____

I further warrant that all statements contained in said Proposal and in this Affidavit are true and correct and made with full knowledge that the said Authority relies upon the truth of the statements contained in said Proposal and in this Affidavit in awarding the said Contract.

Sworn to and subscribed   By:_____(L.S.)
before me this_____   Person Signing Proposal
day of _____,
20___.   Print Name:_____

_____
Notary Public

My commission expires:

RICHMOND METROPOLITAN TRANSPORTATION AUTHORITY

_____

RICHMOND EXPRESSWAY SYSTEM

RMTA TOLL SYSTEM & SERVICES CONTRACT NO. TSS2017

****

PROPOSAL BOND

KNOW ALL MEN BY THESE PRESENTS, that_____
_____, as Principal/Contractor, and
_____, as Surety, legally authorized to do
business in the Commonwealth of Virginia, are held and firmly bounded unto the
Richmond Metropolitan Transportation Authority, as Authority, in the amount of FIVE (5)
PERCENT OF THE DOLLAR VALUE OF THE TOTAL AMOUNT WRITTEN IN THE
PRPOSAL, on which the Contract is awarded lawful money of the United States of America, for
the payment of which, well and truly to be made, we bind ourselves, our heirs, executors,
administrators, successors and assigns, jointly and severally and firmly by these presents:

WHEREAS, the Contractor is herewith submitting its Proposal for Contract No. TSS2017
entitled RMTA Toll System & Services, in connection with the Richmond Expressway System;and

NOW, THEREFORE, the condition of this obligation is such, that if the Contractor shall
be awarded the Contract upon said Proposal and shall, within fifteen (15) calendar days after the
date of written notice of such award, enter into and deliver a Contract and the prescribed Contract
Bond for the faithful performance of the Contract, together with the required proof of proper
insurance coverage and other necessary documents, then this obligation shall be null and void;
otherwise, to remain in full force and effect, and the Contractor and Surety will pay unto the
Authority the difference in money between the amount of the Total Amount written in the
Proposal of said Contractor and the amount for which the Authority may legally contract
with another party to perform the said work, if the latter amount be in excess of the former;
but in no event shall the Surety's liability exceed the penal sum hereof.

SIGNED AND SEALED this _____day of _____. 20____.

PRINCIPAL/CONTRACTOR

_____
Business Name

_____
Address

Witness or Attest: _____

_____   By:_____(L.S.)
                                                    Title:

(Affix Corporate Seal Here)

SURETY:

_____
Business Name

_____
Address

Witness or Attest: _____

_____
                          By:_____(L.S.)
                                              Title:

(Attach evidence of Power of Attorney)

(Affix Corporate Seal Here)

#	Page	Section	Section Description	Vendor Question	RMTA Response
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

RICHMOND METROPOLITAN TRANSPORTATION AUTHORITY

_____

RICHMOND EXPRESSWAY SYSTEM

RMTA TOLL SYSTEM & SERVICES CONTRACT NO. TSS2017

****

<u>RECEIPT OF ADDENDA</u>

I/We hereby acknowledge receipt of the following addenda and have made the necessary revisions to the RFP and agree that these addenda are included in the Proposal.

<u>Addenda #</u>	<u>Signature</u>	<u>Date</u>
1.		
2.		
3.		
4.		
5.		
6.		

I understand that failure to confirm receipt of addenda may cause the Proposal to be removed from further consideration.

RICHMOND METROPOLITAN TRANSPORTATION AUTHORITY

_____

RICHMOND EXPRESSWAY SYSTEM

****

SWaM Participation

The Authority strongly encourages the submission of bids by qualified contractors whose principal businesses are located in the Richmond Metropolitan Area and further encourage such contractors to utilize the services of local subcontractors and vendors.

In addition the Authority strongly encourages the submission of bids by qualified contractors certified as Small, Women, and Minority Owned (SWaM) businesses and/or Disadvantaged Business Enterprises (DBE).

Furthermore, the Authority encourages the use of certified Small, Women, and Minority Owned (SWaM) businesses and Disadvantaged Business Enterprises (DBE) as subcontractors or vendors to the fullest extent reasonably possible.

Certification:

The Virginia Department of Small Business and Supplier Diversity is responsible for the certification of eligible small, women, and minority-owned businesses to participate in the SWaM Procurement Initiative. They also certify Disadvantaged Business Enterprises (DBEs) for participation under the Virginia Unified Certification Program (as part of the federal DBE Program). Service Disabled Veterans are also able to obtain SWaM certification upon receipt of their certification by the Department of Veterans Services and by meeting the eligibility requirements of the SWaM Program.
http://www.dmbe.virginia.gov/SWaMSearchSub.html

SWaM Category Type:

(As certified by the Virginia Department of Small Business and Supplier Diversity)

Minority Owned (M)
Small Business (S)
Women Owned (W)
Minority Owned with Small Business Certification (MS)
Women Owned with Small Business Certification (WS)

Other SWaM, DBE, WBE and MBE Programs:

Any contractors, subcontractors or vendors whose principal businesses are located outside the Commonwealth of Virginia must submit information on any business that is qualified as a Small, Women-Owned, Minority Owned and/or Disadvantaged Business Enterprises (DBE) by their home state or any federal program .

SwaM Summary:

As a part of the project closeout process and a prerequisite to final payment, the prime contractor shall submit fully executed pages DBE-3 and DBE-4, along with any additional sheets as needed, to document the actual amounts paid to each SWaM and/or DBE businesses that provided service or products during this execution of the contract.

****

Firm Name: _____

Firm Address: _____

Owner/Contact Name: _____

Owner/Contact Phone Number: _____

SWaM Category Type: _____ SWaM Certification Number: _____

Amount Paid: $ _____

****

Firm Name: _____

Firm Address: _____

Owner/Contact Name: _____

Owner/Contact Phone Number: _____

SWaM Category Type: _____ SWaM Certification Number: _____

Amount Paid: $ _____

****

Firm Name: _____

Firm Address: _____

Owner/Contact Name: _____

Owner/Contact Phone Number: _____

SWaM Category Type: _____ SWaM Certification Number: _____

Amount Paid: $ _____

Contractor shall attach additional sheets if needed.

DBE-3

SIGNED AND SEALED THIS _____ day of _____, 20____.

_____

Business Name

_____

Address

_____

By: _____(L.S.)

Title: _____

STATE OF VIRGINIA AT LARGE: }
}
CITY/COUNTY OF   } to-wit:

The foregoing instrument was acknowledged before me this _____day of _____,

20___, by _____, _____of

_____[name]   _____[title]

_____,

_____[business name]

a _____ corporation/partnership, on behalf of said Corporation/partnership,

_____[state]

_____

Notary Public

My Commission expires:_____.

Exhibit J: Terms of Discussion Form

To whom it may concern:

Whereas the Richmond Metropolitan Transportation Authority (hereafter "RMTA") has posted Request For Proposals Number TSS-2017 with exhibits, attachments, appendixes and other information
(hereafter "RFP") on its website at www.rmtaonline.org.

Whereas I, (insert name) _____

am duly authorized by (insert firm's name and legal address)_____

_____

(hereafter "Vendor") to make the following binding commitment for Vendor.

Whereas Vendor has performed a complete and comprehensive review of said RFP including but not limited to the procurement process and the associated schedule described therein.

Therefore be it known that Vendor hereby (insert either the phrase "accepts without reservation" or the phrase "formally protests, for the reasons described in detail on the following pages,")

_____

_____ the procurement process and associated schedule described in the RFP.

Name of Signor Printed: _____

Title of Signor Printed: _____

Signor Signature: _____

Any material alteration to the statements in this form are prohibited and any such alteration may result in a Proposal being removed from further consideration. Attach additional pages as necessary.

RMTA TSS2017 Exhibit J

Exhibit K: ORT Pavement and Gantry Statement Form

To whom it may concern:

Whereas the Richmond Metropolitan Transportation Authority (hereafter "RMTA") has posted Request For Proposals Number TSS-2017 with exhibits, attachments, appendixes and other information
(hereafter "RFP") on its website at www.rmtaonline.org.

Whereas I, (insert name) _____

am duly authorized by (insert firm's name and legal address)_____

_____

(hereafter "Vendor") to make the following binding commitment for Vendor.

Whereas Vendor has performed a complete and comprehensive review of said RFP including but not limited to the procurement process and the associated schedule described therein.

Therefore be it known that Vendor hereby (insert either the phrase "accepts without reservation" or the phrase "formally protests, for the reasons described in detail on the following pages,")

_____

_____ the procurement process and associated schedule described in the RFP.

Name of Signor Printed: _____

Title of Signor Printed: _____

Signor Signature: _____

Any material alteration to the statements in this form are prohibited and any such alteration may result in a Proposal being removed from further consideration. Attach additional pages as necessary.

RMTA TSS2017 Exhibit J

TS-01

Tolling Specification #01: Project Management, Documentation, Design and Test Services

TOLLING SPECIFICATION #01: PROJECT MANAGEMENT, DOCUMENTATION, DESIGN AND TEST SERVICES

TABLE OF CONTENTS

1. ACRONYMS & KEY TERMS

100% Design Review	described in section 4.2.5 below
A	Ampere
ANSI	American National Standards Institute
As-Built Review	described in section 4.2.11 below
Authority	Richmond Metropolitan Transportation Authority
Availability	defined in section 5.1.6 below
AVC	Automatic Vehicle Classification
AVI	Automatic Vehicle Identification
CAD	Computer Aided Design
COTS	Commercial Off The Shelf
CSC	Customer Service Center
Detailed Design Calculations	defined in section 11.3.1 below
Detailed Design Drawings	defined in section 11.3.3 below
Detailed Design Specifications	defined in section 11.3.2 below
DTE	Downtown Expressway
EOR	Engineer Of Record
ETC	Electronic Toll Collection
Extra Work	defined in the Contract (e.g. work resulting from certain motor vehicle accidents)
FAT	Factory Acceptance Test, described in section 4.2.6 below
FHWA	Federal Highway Administration
GAAP	Generally Accepted Accounting Principles
GFCI	Ground Fault Circuit Interrupt
GUI	Graphical User Interface
Host Subsystem	defined in the TS-04 document
IAG	(E-ZPass) Inter-Agency Group

ICS	Image Capture System
Initial Design Review	described in section 4.2.3 below
Installation-Ready Design Review	described in section 4.2.7 below
KPI	Key Performance Indicators
KVA	Kilo Volt-Ampere
KW	Kilowatt
LAN	Local Area Network
Management Plan	described in section 4.3 below
Midpoint Design Review	described in section 4.2.4 below
MOMS	Maintenance On-line Management System
Monthly Progress Report	described in section 4.5.1 below
MOT	Maintenance Of Traffic
MM	Multimode
MPH	Miles Per Hour
MTBF	Mean Time Between Failures
NEC	National Electrical Code
NFPA	National Fire Protection Association
NTP	Notice To Proceed in describing project schedule milestones, Network Time Protocol in describing System timing requirements
O&M Manager	Operations and Maintenance Manager
OEM	Original Equipment Manufacturer
ORT	Open Road Tolling
ORT Zone Subsystem	defined in the TS-05 document
OSHA	Occupational Safety and Health Administration
PAT	Project Acceptance Test, described in section 4.2.10 below
Progress Schedule	defined in section 4.3.2 below
RAID	Redundant Arrays of Independent Disks
RMTA	Richmond Metropolitan Transportation Authority

RSAT	Revenue Service Acceptance Test, as described in section 4.2.9 below
SDD	System Detailed Design, as described in section 5.3 below
Shop Drawings	described in section 11.3.4 below
SDR	System Design Requirements, as described in in section 5.2 below
Submittal	a required documentation delivery from the Contractor as defined in section 4.6 below
Toll System	term used to collectively describe the Host Subsystem, the ORT Zone Subsystem and the Traditional Lane Subsystem as specified in this Contract
Tolling Specifications	Specifications unique to this Contract
TS-01	Tolling Specification #01 (Project Management, Documentation, Design and Test Services)
TS-02	Tolling Specification #02 (Operations And Maintenance Work)
TS-03	Tolling Specification #03 (Hardware and Installation)
TS-04	Tolling Specification #04 (Host Subsystem)
TS-05	Tolling Specification #05 (ORT Zone Subsystem)
TS-06	Tolling Specification #06 (Traditional Lane Subsystem)
TS-xx	The Tolling Specification documents in general
UL	Underwriters Laboratory
UV	Ultraviolet
UPS	Uninterruptible Power Supply
V	Volt
VDOT	Virginia Department of Transportation
VDOT E-ZPass CSC	the combined Customer Service Center and Violations Processing Center contracted for by VDOT and used to process E-ZPass transactions and potential toll violations
VPN	Virtual Private Network
W	Watt
WAN	Wide Area Network

2. OVERVIEW

Three (3) Tolling Specification documents are applicable to every element of the Toll System under the Contract:

- This document (TS-01), describing the Authority's requirements for project management, documentation, design and test services provided by the Contractor

- The TS-02 document, describing the Authority's requirements for operations and maintenance services provided by the Contractor

- The TS-03 document, describing the Authority's requirements for hardware furnished by the Contractor and associated installation services provided by the Contractor

The Contractor shall integrate, furnish and install the Host Subsystem; ORT Zone Subsystem; and Traditional Lane Subsystem. The functional requirements for these systems are detailed in the TS-04, TS-05 and TS-06 documents respectively.

3. APPLICABLE STANDARDS, CODES, AND PUBLICATIONS

Proposal Criteria
As part of their proposal, the Offeror shall describe what actions they have taken for compliance with the Statement on Standards for Attestation Engagements (SSAE) No. 16.
As part of their proposal, the Offeror shall list those projects where certification to such standards was achieved, the type of certification and the certifying entity.
As part of their proposal, the Offeror shall describe their experience in delivering toll systems, Intelligent Transportation Systems and other systems with roadside electronics compliant with current and future Regional and National Interoperability Specifications.

Contract Criteria	
TS-01 Requirement #3-1	All elements of the Toll System shall comply with the hardware and installation related standards, codes and publications listed in the TS-03 document.
TS-01 Requirement #3-2	All elements of the Toll System shall be compliant with the Virginia Department of Transportation privacy and personal information protection standards, codes or publications in effect on the most recent date of either RFP advertisement or any addendum to this RFP addressing privacy or personal information protection.
TS-01 Requirement #3-3	The Contractor shall follow the two-phase, systems engineering process compliant with USDOT Final Rule, Park 940-Intelligent Transportation System Architecture and Standards Section 940.11 Project Implementation policy, a copy of which is available at: www.ops.fhwa.dot.gov/its_arch_imp/policy.htm

Contract Criteria	
TS-01 Requirement #3-4	When configured to interface with the VDOT E-ZPass CSC via SFTP (specified in Tolling Specification #04), all elements of the Toll System shall be GAAP compliant and meet the requirements for an SSAE-16 Type II Audit.

Additional standards, codes and publications applicable to a specific subsystem of the Toll System are listed in the respective Tolling Specification document.

4. PROJECT MANAGEMENT

	Proposal Criteria
The Offeror shall include in their proposal a summary of no more than two (2) page-sides, detailing their Project Management methodology and how this will be implemented across all Contract tasks. This summary shall address how this methodology will be implemented within the Offeror's firm and all subcontractors, suppliers and/or other firms involved in this project and include a table identifying those reference projects where this same methodology was implemented and used by the Offeror and their associated subcontractors and suppliers.	

Contract Criteria	
TS-01 Requirement #4-1	The Contractor shall select, implement and utilize a well-defined methodology for confirming detailed requirements and managing the life cycle of activities to complete the various aspects of this Contract and their related project deliverables while minimizing the risks associated with misunderstanding technical detail and project milestone requirements.

4.1. Key Staff
The Contract defines Key Staff and the RFP instructions detail the Key Staff information required in the Offeror's proposal.

Contract Criteria	
TS-01 Requirement #4.1-1	The Project Manager shall serve as the Authority's point of contact for all communications between the Authority and the Contractor from the time of Notice To Proceed until the successful completion of the As-Built Review Milestone (see section 4.2.11 below).
TS-01 Requirement #4.1-2	The Contractor shall staff the position of Project Manager for this Contract from the time of Notice To Proceed until the successful completion of the As-Built Review Milestone.
TS-01 Requirement #4.1-3	The Project Manager shall have at least five (5) years of experience managing similar projects in the toll collection industry or related industry and at least two (2) years of experience managing roadway tolling projects.

Contract Criteria	
TS-01 Requirement #4.1-4	The Project Manager shall coordinate all work on the Contract including but not limited to the work of the O&M Manager and Quality Manager described immediately below and the work of the Engineer Of Record.
TS-01 Requirement #4.1-5	The Contractor shall staff the position of O&M Manager for this Contract between the time Factory Acceptance Test commences and the end of the Contract.
TS-01 Requirement #4.1-6	The O&M Manager shall not be the Project Manager.
TS-01 Requirement #4.1-7	The Contractor shall staff the position of Quality Manager for this Contract between the time when Notice To Proceed is issued by the Authority and the time when the Authority fully releases the Performance Bond.
TS-01 Requirement #4.1-8	The Quality Manager shall not be the Project Manager or the O&M Manager.
TS-01 Requirement #4.1-9	The Quality Manager shall have at least five (5) years of experience in quality assurance and testing on similar projects in the toll collection industry or related industry and at least two (2) years of experience as quality manager on a roadway tolling project.
TS-01 Requirement #4.1-10	The Contractor shall equip the Project Manager, O&M Manager and Quality Manager with landline and mobile phone communications, voicemail or answering service, e-mail communications, access to the Maintenance On-Line Management Subsystem (MOMS), other systems and services as requested from time to time by the Authority and access to all deliverables provided by the Contractor for the Contract.
TS-01 Requirement #4.1-11	Any change in Key Staff shall be subject to the Authority's approval.

4.2. Project Milestones

The Authority will evaluate and pay for progress based on the sequential project milestones in the Contract payment schedule as further described below.

4.2.1. Baseline Schedule Agreement Milestone

This milestone occurs after the Contractor submits a Progress Schedule (section 4.3.2 below) acceptable to the Authority. The primary objective of this milestone is to acquaint the Authority with the sequence of work to be performed by the Contractor for the entirety of the project.

Contract Criteria	
TS-01 Requirement #4.2.1-1	The Contractor shall provide a complete draft of the Progress Schedule (section 4.3.2 below) to the Authority within fourteen (14) calendar days of receiving Notice To Proceed.

Contract Criteria	
TS-01 Requirement #4.2.1-2	This draft of the schedule shall satisfy all of the requirements describing the schedule (see section 4.3.2 below).
TS-01 Requirement #4.2.1-3	This draft of the schedule shall identify the information, review cycles and decisions required from the Authority to keep the project on schedule.
TS-01 Requirement #4.2.1-4	The Contractor shall revise this draft of the Progress Schedule for as many iterations as necessary for the Authority to declare it the baseline schedule.
TS-01 Requirement #4.2.1-5	Prior to successful completion of this milestone, the Contractor shall provide the Authority with the Health and Safety Plan (see section 11.1 below).

4.2.2. Management Plan Review Milestone

This milestone occurs after the Contractor submits a Management Plan (see section 4.3 below) acceptable to the Authority. The primary objective of this milestone is to acquaint the Authority with the Contractor's coordinated plans for managing the entirety of the project.

Contract Criteria	
TS-01 Requirement #4.2.2-1	The Contractor shall provide a draft of the Management Plan no more than twenty-eight (28) calendar days after Notice To Proceed.
TS-01 Requirement #4.2.2-2	This draft of the Management Plan shall contain a 100% complete Progress Schedule, addressing all Authority comments from its previous submission.
TS-01 Requirement #4.2.2-3	This draft of the Management Plan shall contain a 100% complete quality section satisfying all of the requirements described in section 4.3.3 below.
TS-01 Requirement #4.2.2-4	This draft of the Management Plan shall contain a 100% complete security section that identifies all scheduled and ad hoc audits and satisfies all other requirements described in section 4.3.4 below.
TS-01 Requirement #4.2.2-5	This draft of the Management Plan shall contain a 100% complete configuration and change management section satisfying all of the requirements described in section 4.3.5 below.
TS-01 Requirement #4.2.2-6	This draft of the Management Plan shall contain a 100% software development section satisfying all of the requirements described in section 4.3.6 below.
TS-01 Requirement #4.2.2-7	This draft of the Management Plan shall contain a comprehensive outline of the data migration section addressing all of the requirements described in section 4.3.7 below.

Contract Criteria	
TS-01 Requirement #4.2.2-8	This draft of the Management Plan shall contain a comprehensive outline of the testing section addressing all of the requirements described in section 4.3.8 below.
TS-01 Requirement #4.2.2-9	This draft of the Management Plan shall contain conceptual outlines of the training, installation, operations and maintenance sections of the Management Plan (see sections 4.3.9 through 4.3.11 below)
TS-01 Requirement #4.2.2-10	This draft of the Management Plan shall contain a complete Bill Of Materials reflecting the current design with confirmed quantities and prices, and tracking any changes since its submission as part of the Contractor's proposal.
TS-01 Requirement #4.2.2-11	The Contractor's management team, Key Staff and an employee of each subcontractor shall attend the comment review meeting(s) for the Management Plan.
TS-01 Requirement #4.2.2-12	The Contractor shall revise the documents above as necessary for the Authority to declare each as "approved-in-principle" for the degree of completeness associated with the Submittal.
TS-01 Requirement #4.2.2-13	Prior to successful completion of this milestone, the Contractor shall provide the Authority with the complete list of the information needs and decisions required from the Authority to keep the project on schedule.

The Authority will schedule a meeting to review its comments on this Submittal. The Authority will provide the Contractor with notice of this meeting at least fourteen (14) calendars days prior to its start.

4.2.3. Initial Design Review Milestone

This milestone occurs after the Contractor submits an Initial Design Review Submittal acceptable to the Authority. The primary objective of this milestone is to acquaint the Authority with the Contractor's intended design, determine external interfaces and identify issues.

Contract Criteria	
TS-01 Requirement #4.2.3-1	The Contractor shall successfully complete the Baseline Schedule Agreement Milestone and Management Plan Review Milestone (see sections 4.2.1 and 4.2.2 above) to the Authority's satisfaction prior to commencing the following work.
TS-01 Requirement #4.2.3-2	The Contractor shall develop and provide a Submittal as detailed in section 4.6 of this TS-01 document and meeting all requirements described below (hereafter the Initial Design Review Submittal) at least twenty-one (21) calendar days prior to the scheduled successful completion of the Initial Design Review Milestone. The Contractor is encouraged to make partial deliveries much earlier than the twenty-one (21) day deadline to avoid creating a backlog in the Authority's review and comment process and corresponding delays.
TS-01 Requirement #4.2.3-3	The Initial Design Review Submittal shall include an updated draft of the Management Plan (see section 4.3 below).

Contract Criteria	
TS-01 Requirement #4.2.3-4	This draft of the Management Plan shall contain updates to the Progress Schedule.
TS-01 Requirement #4.2.3-5	This draft of the Management Plan shall contain quality, security, configuration and change management and software development sections that remain 100% complete and are updated to address all Authority comments from their previous submission.

TS-01 Requirement #4.2.3-6	This draft of the Management Plan shall contain a testing section that is 100% complete and addressing all Authority comments from its previous submission. This testing section shall describe:
	- All:
	  o Vehicle types to be used for off-site and on-site testing
	  o Transponder types to be used for off-site and on-site testing
	  o Transponder mounting locations (e.g. interior windshield, license plate, cab roof, motorcycle, etc.) used for off-site and on-site testing
	  o License plate types to be used for off-site and on-site testing
	- Traditional Lane:
	  o Configurations that will be provided for off-site testing
	  o Modes of operation that will be subjected to off-site and on-site testing and the quantities of vehicle passes anticipated for each
	- ORT Zone:
	  o Configurations that will be provided for off-site testing
	  o Modes of operation that will be subjected to off-site and on-site testing and the quantities of vehicle passes anticipated for each

TS-01 Requirement #4.2.3-7	This testing section shall show the types of information provided in, and format of, the Detailed Test Procedures document (see section 5.4 below).
TS-01 Requirement #4.2.3-8	This draft of the Management Plan shall contain data migration, training, installation, operations and maintenance sections that are approximately 50% complete and address all Authority comments from their previous submission.
TS-01 Requirement #4.2.3-9	This draft of the Management Plan shall contain a Bill Of Materials that remains 100% complete and is updated to address all Authority comments from the previous review (see section 4.2.2 above) and issues discovered during the Contractor's design process.
TS-01 Requirement #4.2.3-10	The Initial Design Review Submittal shall include drafts of all Detailed Design Calculations (see section 11.3.1 below). At a minimum, each shall have an appropriate cover sheet and a description of the calculation's scope.
TS-01 Requirement #4.2.3-11	The Initial Design Review Submittal shall include drafts of all Detailed Design Specifications (see section 11.3.2 below). At a minimum, each shall have an appropriate cover sheet, a complete table of contents and a conceptual outline.

Contract Criteria	
TS-01 Requirement #4.2.3-12	The Initial Design Review Submittal shall include drafts of all Detailed Design Drawings (see section 11.3.3 below). At a minimum, each shall have an appropriate title, border and background and the drawing package as a whole shall be 40% complete.
TS-01 Requirement #4.2.3-13	The Initial Design Review Submittal shall include drafts of all Shop Drawings (see section 11.3.4 below). At a minimum, each shall have an appropriate cover sheet and a complete table of contents.
TS-01 Requirement #4.2.3-14	The Initial Design Review Submittal shall include drafts of all Maintenance Of Traffic drawings and specifications (see section 11.4 below). At a minimum, each shall have an appropriate cover sheet and a conceptual outline.
TS-01 Requirement #4.2.3-15	The Initial Design Review Submittal shall include a draft of the System Design Requirements document (see section 5.2 below) that is 100% complete.
TS-01 Requirement #4.2.3-16	The Initial Design Review Submittal shall include a draft of the System Detailed Design document (see section 5.3 below). At a minimum, the document shall have an appropriate cover sheet, a complete table of contents and a conceptual outline.
TS-01 Requirement #4.2.3-17	The Initial Design Review Submittal shall include a draft of the Detailed Test Procedures document (see section 5.4 below). At a minimum, the document shall have an appropriate cover sheet and a conceptual outline.
TS-01 Requirement #4.2.3-18	The Initial Design Review Submittal shall include a draft of the System Manuals described in sections 5.5.1 through 5.5.4 below. At a minimum, each shall have an appropriate cover sheet, a complete table of contents and a conceptual outline.
TS-01 Requirement #4.2.3-19	The Initial Design Review Submittal shall include a draft of the Training Materials described in sections 5.6.1 through 5.6.3 below. At a minimum, each shall have an appropriate cover sheet, a complete table of contents and a conceptual outline.
TS-01 Requirement #4.2.3-20	The Contractor's management team, Key Staff and an employee of each subcontractor shall attend the comment review meeting(s) for the documents and drawings above.
TS-01 Requirement #4.2.3-21	The Contractor shall revise the documents and drawings above as necessary for the Authority to declare each document or drawing above as "approved-in-principle" for the specified level of completeness.
TS-01 Requirement #4.2.3-22	Prior to successful completion of the Initial Design Review Milestone, the Contractor shall provide the Authority with an updated complete list of the information needs and decisions required from the Authority to keep the project on schedule.

The Authority will schedule a meeting to review its comments regarding the Initial Design Review Submittal. The Authority will provide the Contractor with notice of this meeting at least fourteen (14) calendars days prior to its start.

4.2.4. Midpoint Design Review Milestone

This milestone occurs after the Contractor submits a Midpoint Design Review Submittal acceptable to the Authority. The primary objective of this milestone is to review progress, review the adequacy of the selected design approach and evaluate specification compliance.

Contract Criteria	
TS-01 Requirement #4.2.4-1	The Contractor shall successfully complete the Initial Design Review Milestone (section 4.2.3 above) to the Authority's satisfaction prior to commencing the following work.
TS-01 Requirement #4.2.4-2	The Contractor shall develop and provide a Submittal as detailed in section 4.6 of this TS-01 document and meeting all requirements described below (hereafter the Midpoint Design Review Submittal) at least twenty-one (21) calendar days prior to the scheduled successful completion of the Midpoint Design Review Milestone. The Contractor is encouraged to make partial deliveries much earlier than the twenty-one (21) day deadline to avoid creating a backlog in the Authority's review and comment process and corresponding delays.
TS-01 Requirement #4.2.4-3	This Management Plan shall contain a Progress Schedule that remains complete and is updated to address all Authority comments from the Initial Design Review and current status.
TS-01 Requirement #4.2.4-4	The Midpoint Design Review Submittal shall contain an updated Management Plan (see section 4.3 below).
TS-01 Requirement #4.2.4-5	This Management Plan shall contain quality, security, configuration and change management and software development sections that remain complete and are updated to address all Authority comments from the Initial Design Review.
TS-01 Requirement #4.2.4-6	This Management Plan shall contain data migration, testing, training, installation, operations and maintenance sections that are 100% complete and address all Authority comments from the Initial Design Review.
TS-01 Requirement #4.2.4-7	This Management Plan shall contain a Bill Of Materials that remains complete and is updated to address all Authority comments from the Initial Design Review and all issues discovered during the Contractor's design process.
TS-01 Requirement #4.2.4-8	The Midpoint Design Review Submittal shall include all Detailed Design Calculations (see section 11.3.1 below). At a minimum, each shall have an appropriate cover sheet and a description of the calculation's scope and the calculation package as a whole shall be approximately 40% complete.
TS-01 Requirement #4.2.4-9	The Midpoint Design Review Submittal shall include all Detailed Design Specifications (see section 11.3.2 below). At a minimum, each shall have an appropriate cover sheet, a complete table of contents and a conceptual outline and the calculation package as a whole shall be approximately 40% complete.
TS-01 Requirement #4.2.4-10	The Midpoint Design Review Submittal shall include all Detailed Design Drawings (see section 11.3.3 below). At a minimum, each shall have an appropriate title, border and background and the drawing package as a whole shall be approximately 80% complete.

Contract Criteria	
TS-01 Requirement #4.2.4-11	The Midpoint Design Review Submittal shall include all Shop Drawings (see section 11.3.4 below). At a minimum, each shall have an appropriate cover sheet, a complete table of contents and a conceptual outline and the calculation package as a whole shall be approximately 40% complete.
TS-01 Requirement #4.2.4-12	The Midpoint Design Review Submittal shall include all Maintenance Of Traffic drawings and specifications (see section 11.4 below). At a minimum, each shall have an appropriate cover sheet, a complete table of contents and a conceptual outline and the maintenance of traffic package as a whole shall be approximately 40% complete.
TS-01 Requirement #4.2.4-13	The Midpoint Design Review Submittal shall include the System Design Requirements document (see section 5.2 below). It shall be 100% complete and address all Authority comments from the Initial Design Review and issues discovered during the Contractor's design process.
TS-01 Requirement #4.2.4-14	The Midpoint Design Review Submittal shall include the System Detailed Design document (see section 5.3 below). At a minimum, this document shall contain a complete table of contents and a conceptual outline and be approximately 40% complete.
TS-01 Requirement #4.2.4-15	The Midpoint Design Review Submittal shall include the Detailed Test Procedures document (see section 5.4 below) updated to address all Authority comments from the Initial Design Review and issues discovered during the Contractor's design process. The Factory Acceptance Test, Revenue Service Acceptance Test and Project Acceptance Test aspects of the Detailed Test Procedures document shall each be 80% complete.
TS-01 Requirement #4.2.4-16	The Midpoint Design Review Submittal shall include all System Manuals (see sections 5.5.1 through 5.5.4 below) updated to address all Authority comments from the Initial Design Review and issues discovered during the Contractor's design process. The system administrator manual, plaza supervisor manual, toll collection attendant manual and system maintenance manual package as a whole shall be approximately 40% complete.
TS-01 Requirement #4.2.4-17	The Midpoint Design Review Submittal shall include all Training Materials (see sections 5.6.1 through 5.6.3 below) updated to address all Authority comments from the Initial Design Review and issues discovered during the Contractor's design process. The instructor guide, training aid and student workbook package for all four (4) courses as a whole shall be approximately 40% complete.
TS-01 Requirement #4.2.4-18	The Contractor shall revise the documents and drawings above as necessary for the Authority to declare each document or drawing above as "approved-in-principle" for the specified level of completeness.
TS-01 Requirement #4.2.4-19	The Contractor shall provide all of the documents above in two (2) electronic versions, where one version reflects changes from the previous submittal as markups ("red lines") and the other version is in clean form.

Contract Criteria	
TS-01 Requirement #4.2.4-20	Prior to successful completion of the Midpoint Design Review Milestone, the Contractor shall provide a summary of all electromagnetic field surveys and measurements (described in the TS-03 document) with a statement that the Contractor fully understands and accepts the existing conditions at each work location.
TS-01 Requirement #4.2.4-21	The Contractor's management team, Key Staff and an employee of each subcontractor shall attend the comment review meeting(s) for the documents and drawings above.
TS-01 Requirement #4.2.4-22	Prior to successful completion of the Midpoint Design Review Milestone, the Contractor shall demonstrate the Toll System's use of the complete interface with the VDOT's E-ZPass Customer Service Center.
TS-01 Requirement #4.2.4-23	Prior to successful completion of the Midpoint Design Review Milestone, the Contractor shall provide the Authority with an updated complete list of the information needs and decisions required from the Authority to keep the project on schedule.

The Authority will schedule a meeting to review its comments on the Midpoint Design Review Submittal. The Authority will provide the Contractor with notice of this meeting at least fourteen (14) calendars days prior to its start.

4.2.5. 100% Design Review Milestone

This milestone occurs after the Contractor submits a 100% Design Review Submittal acceptable to the Authority. The primary objective of this milestone review is to review the 100% complete System design and evaluate Contractor readiness for Factory Acceptance Test.

Contract Criteria	
TS-01 Requirement #4.2.5-1	The Contractor shall successfully complete Midpoint Design Review Milestone (section 4.2.4 above) to the Authority's satisfaction prior to commencing the following work.
TS-01 Requirement #4.2.5-2	The Contractor shall develop and provide a Submittal as detailed in section 4.6 of this TS-01 document and meeting all requirements described below (hereafter the 100% Design Review Submittal) at least twenty-one (21) calendar days prior to the scheduled successful completion of the 100% Design Review Milestone. The Contractor is encouraged to make partial deliveries much earlier than the twenty-one (21) day deadline to avoid creating a backlog in the Authority's review and comment process and corresponding delays.
TS-01 Requirement #4.2.5-3	This Management Plan shall contain a Progress Schedule that remains complete and is updated to address all Authority comments from the Midpoint Design Review and current status.
TS-01 Requirement #4.2.5-4	The 100% Design Review Submittal shall contain a Management Plan (see section 4.3 below) that remains complete and is updated to address all Authority comments from the Midpoint Design Review.

Contract Criteria	
TS-01 Requirement #4.2.5-5	This Management Plan shall contain a Bill Of Materials that remains complete and is updated to address all Authority comments from the Midpoint Design Review and all issues discovered during the Contractor's design process.
TS-01 Requirement #4.2.5-6	The 100% Design Review Submittal shall include a list of all COTS equipment and all firmware changes released by the respective manufacturer; a detailed description of which will be applied to all Factory Acceptance Test equipment; and a detailed description of which will be applied to all equipment installed by the Contractor at the Authority's facilities prior to Revenue Service Acceptance Test.
TS-01 Requirement #4.2.5-7	The 100% Design Review Submittal shall include a list of all COTS software and all new versions, patches and fixes released by the respective manufacturer; a detailed description of which will be installed for Factory Acceptance Test; and a detailed description of which will be installed by the Contractor at the Authority's facilities prior to Revenue Service Acceptance Test.
TS-01 Requirement #4.2.5-8	The 100% Design Review Submittal shall include all Detailed Design Calculations (see section 11.3.1 below). Each shall be 100% complete and updated to address all Authority comments from the Midpoint Design Review.
TS-01 Requirement #4.2.5-9	The 100% Design Review Submittal shall include all Detailed Design Specifications (see section 11.3.2 below). Each shall be 100% complete and updated to address all Authority comments from the Midpoint Design Review.
TS-01 Requirement #4.2.5-10	The 100% Design Review Submittal shall include all Detailed Design Drawings (see section 11.3.3 below). Each shall be 100% complete and updated to address all Authority comments from the Midpoint Design Review.
TS-01 Requirement #4.2.5-11	The 100% Design Review Submittal shall include all Shop Drawings (see section 11.3.4 below). At a minimum, each shall have an appropriate cover sheet describing each drawing's scope and the Shop Drawing package as a whole shall be approximately 80% complete and updated to address all Authority comments from the Midpoint Design Review.
TS-01 Requirement #4.2.5-12	The 100% Design Review Submittal shall include all installation checklists for use in the field and addressing System Integration items that include but are not limited to: a) A complete listing of all Toll System switch settings b) A complete listing of any other hardware configuration parameters c) A complete listing of software configuration parameters d) Software installation, configuration and initialization instructions Each shall be 100% complete.
TS-01 Requirement #4.2.5-13	The 100% Design Review Submittal shall include all installation checklists for use in the field and derived from the Infrastructure Documentation. Each shall be 100% complete.

Contract Criteria	
TS-01 Requirement #4.2.5-14	The 100% Design Review Submittal shall include all Maintenance Of Traffic drawings and specifications (see section 11.4 below). At a minimum, each shall have an appropriate cover sheet and a description of each drawing's scope and the Maintenance Of Traffic drawing package as a whole shall be approximately 80% complete and address all Authority comments from the Midpoint Design Review.
TS-01 Requirement #4.2.5-15	The 100% Design Review Submittal shall include the System Design Requirements document (see section 5.2 below) addressing all Authority comments from the Midpoint Design Review and it shall be 100% complete.
TS-01 Requirement #4.2.5-16	The 100% Design Review Submittal shall include the System Detailed Design document (see section 5.3 below) addressing all Authority comments from the Midpoint Design Review and it shall be 100% complete.
TS-01 Requirement #4.2.5-17	The 100% Design Review Submittal shall include the Detailed Test Procedures document (see section 5.4 below) addressing all Authority comments from the Midpoint Design Review and each shall be 100% complete, including: a) Factory Acceptance Test b) Revenue Service Acceptance Test c) Project Acceptance Test
TS-01 Requirement #4.2.5-18	The 100% Design Review Submittal shall include all System Manuals (see sections 5.5.1 through 5.5.4 below) addressing all Authority comments from the Midpoint Design Review and each shall be 100% complete, including: a) System Administrator Manual b) Plaza Supervisor Manual c) Toll Collection Attendant manual d) System Maintenance Manual
TS-01 Requirement #4.2.5-19	The 100% Design Review Submittal shall include all Training Materials described in sections 5.6.1 through 5.6.3 below. At a minimum, each shall have an appropriate cover sheet, a complete table of contents and a conceptual outline and the training materials package as a whole shall be approximately 80% complete, including: a) An instructor guide for each of the four (4) courses in section 8 below b) Training aids for each of the four (4) courses in section 8 below c) Student workbooks for each of the four (4) courses in section 8 below
TS-01 Requirement #4.2.5-20	The Contractor shall provide all of the documents and drawings above in two (2) electronic versions, where one version reflects changes from the previous submittal as markups ("red lines") and the other version is in clean form.
TS-01 Requirement #4.2.5-21	The Contractor's management team, Key Staff and an employee of each subcontractor shall attend the comment review meeting(s) for the documents and drawings above.
TS-01 Requirement #4.2.5-22	The Contractor shall revise the documents and drawings above as necessary for the Authority to declare each document or drawing above as "approved-in-principle" for the specified level of completeness.

Contract Criteria	
TS-01 Requirement #4.2.5-23	Prior to successful completion of the 100% Design Review Milestone, the Contractor shall provide the Authority with an updated complete list of the information needs and decisions required from the Authority to keep the project on schedule.

The Authority will schedule a meeting to review its comments on the 100% Design Review Submittal. The Authority will provide the Contractor with notice of this meeting at least fourteen (14) calendars days prior to its start.

4.2.6. Factory Acceptance Test Milestone

This milestone occurs at the successful completion of Factory Acceptance Test, as solely determined by the Authority. The primary objective of this milestone is to demonstrate successful integration and operation of all Toll System equipment and software.

Contract Criteria	
TS-01 Requirement #4.2.6-1	The Contractor shall successfully complete the 100% Design Review Milestone (section 4.2.4 above) to the Authority's satisfaction prior to commencing the following work.
TS-01 Requirement #4.2.6-2	Fourteen (14) calendar days prior to the start of Factory Acceptance Test, the Contractor shall confirm that the test configurations used in Factory Acceptance Test shall be the same as those described in the Detailed Test Procedures or report any proposed exceptions. Acceptance of such proposed exceptions shall be at the sole discretion of the Authority.
TS-01 Requirement #4.2.6-3	Fourteen (14) calendar days prior to the start of Factory Acceptance Test, the Contractor shall provide an updated list of all COTS equipment and all firmware changes released by the respective manufacturer and a detailed description of which will be applied to all Factory Acceptance Test equipment.
TS-01 Requirement #4.2.6-4	Fourteen (14) calendar days prior to the start of Factory Acceptance Test, the Contractor shall provide an updated list of all COTS software and all new versions, patches and fixes released by the respective manufacturer and a detailed description of which will be installed on all systems used in Factory Acceptance Test.
TS-01 Requirement #4.2.6-5	Fourteen (14) calendar days prior to the start of Factory Acceptance Test, the Contractor shall electronically provide to the Authority a copy of all checklists, forms and other means that will be used to manually record Factory Acceptance Test observations and results.
TS-01 Requirement #4.2.6-6	The Contractor shall repeat Factory Acceptance Test in its entirety until the Authority is satisfied that the Toll System meets all stated requirements.
TS-01 Requirement #4.2.6-7	The Contractor's management team, Key Staff and an employee of each subcontractor shall attend a working meeting to review Factory Acceptance Test observations.

Contract Criteria	
TS-01 Requirement #4.2.6-8	Prior to successful completion of the Factory Acceptance Test Milestone, the Contractor shall provide the Authority with an updated complete list of the information needs and decisions required from the Authority to keep the project on schedule.

Requirements specific to conducting Factory Acceptance Test are detailed in section 7 below.

Requirements for the management of Factory Acceptance Test activities are detailed in section 4.3.8 below.

4.2.7. Installation-Ready Design Review Milestone

This milestone occurs after the Contractor submits an Installation-Ready Design Review Submittal acceptable to the Authority. The primary objective of this milestone is to demonstrate a high state of readiness before equipment is installed at the Authority's facilities.

Contract Criteria	
TS-01 Requirement #4.2.7-1	The Contractor shall successfully complete the Factory Acceptance Test Milestone (see section 4.2.6 above) to the Authority's satisfaction prior to commencing the following work.
TS-01 Requirement #4.2.7-2	The Contractor shall develop and provide a Submittal as detailed in section 4.6 of this TS-01 document and meeting all requirements described below (hereafter the Installation-Ready Design Review Submittal) at least twenty-one (21) calendar days prior to the scheduled successful completion of the Installation-Ready Design Review Milestone. The Contractor is encouraged to make partial deliveries much earlier than the twenty-one (21) day deadline to avoid creating a backlog in the Authority's review and comment process and corresponding delays.
TS-01 Requirement #4.2.7-3	This Management Plan shall include a Progress Schedule that remains complete and is updated to address all Authority comments from the 100% Design Review and current status.
TS-01 Requirement #4.2.7-4	The Installation-Ready Design Review Submittal shall include a Management Plan (see section 4.3 below) that remains complete and is updated to address all Authority comments from the 100% Design Review.
TS-01 Requirement #4.2.7-5	This Management Plan shall contain a Bill Of Materials that remains complete and is updated to address all Authority comments from the 100% Design Review and all issues discovered during the Contractor's design process.
TS-01 Requirement #4.2.7-6	The Installation-Ready Design Review Submittal shall include a list of all COTS equipment and all firmware changes released by the respective manufacturer and a detailed description of which will be applied to all equipment installed by the Contractor at the Authority's facilities prior to Revenue Service Acceptance Test.

Contract Criteria	
TS-01 Requirement #4.2.7-7	The Installation-Ready Design Review Submittal shall include a list of all COTS software and all new versions, patches and fixes released by the respective manufacturer and identifying those that will be installed by the Contractor at the Authority's facilities prior to Revenue Service Acceptance Test.
TS-01 Requirement #4.2.7-8	The Installation-Ready Design Review Submittal shall include all Detailed Design Calculations in electronic form (see section 11.3.1 below). Each shall address all comments from the 100% Design Review to the Authority's satisfaction and be 100% complete.
TS-01 Requirement #4.2.7-9	The Installation-Ready Design Review Submittal shall include such Detailed Design Calculations in hardcopy form as follows: a) One (5) bound paper copy printed double-sided, on quality paper cut to 8.5" by 11" size b) One (1) unbound paper copy printed single-sided, on quality paper cut to 8.5" by 11" size and easily reproducible within the Authority The Engineer Of Record shall sign and emboss the cover sheet of all such paper copies with their seal.
TS-01 Requirement #4.2.7-10	The Installation-Ready Design Review Submittal shall include all Detailed Design Specifications in electronic form (see section 11.3.2 below). Each shall address all comments from the 100% Design Review to the Authority's satisfaction and be 100% complete.
TS-01 Requirement #4.2.7-11	The Installation-Ready Design Review Submittal shall include such Detailed Design Specifications in hardcopy form as follows: a) One (1) bound paper copy printed double-sided, on quality paper cut to 8.5" by 11" size b) One (1) unbound paper copy printed single-sided, on quality paper cut to 8.5" by 11" size and easily reproducible within the Authority The Engineer Of Record shall sign and emboss the cover sheet of all such paper copies with their seal.
TS-01 Requirement #4.2.7-12	The Installation-Ready Design Review Submittal shall include all Detailed Design Drawings in electronic form (see section 11.3.3 below). Each shall address all comments from the 100% Design Review to the Authority's satisfaction and be 100% complete.
TS-01 Requirement #4.2.7-13	The Installation-Ready Design Review Submittal shall include one (1) complete set of Detailed Design Drawings on black-line Mylar that is a minimum of 2 mil thick, double-matte and cut to 34" x 44" size. The Engineer Of Record shall emboss all such Mylar sheets with their seal and rub the embossment with carbon paper, or an alternative method with similar characteristics shall be used, so that the seal will be visible on all prints made from said Mylar sheets.

Contract Criteria	
TS-01 Requirement #4.2.7-14	The Installation-Ready Design Review Submittal shall include all Shop Drawings in electronic form (see section 11.3.4 below). Each shall address all comments from the 100% Design Review to the Authority's satisfaction and be 100% complete.
TS-01 Requirement #4.2.7-15	The Installation-Ready Design Review Submittal shall include such Shop Drawings in hardcopy form as follows: a) One (1) bound paper copy printed double-sided, on quality paper b) One (1) unbound paper copy printed single-sided, on quality paper and easily reproducible within the Authority Each Shop Drawing shall be signed and sealed by the Engineer Of Record for the Installation-Ready Design Submittal and the As Built Submittal.
TS-01 Requirement #4.2.7-16	The Installation-Ready Design Review Submittal shall include all Maintenance Of Traffic Drawings in electronic form (see section 11.4 below). Each shall address all comments from the 100% Design Review to the Authority's satisfaction and be 100% complete.
TS-01 Requirement #4.2.7-17	The Installation-Ready Design Review Submittal shall include one (1) complete set of Maintenance Of Traffic Drawings on black-line Mylar that is a minimum of 2 mil thick, double-matte and cut to 34" x 44" size. The Engineer Of Record shall emboss all such Mylar sheets with their seal and rub the embossment with carbon paper, or an alternative method with similar characteristics shall be used, so that the seal will be visible on all prints made from said Mylar sheets.
TS-01 Requirement #4.2.7-18	The Installation-Ready Design Review Submittal shall include all installation checklists for use in the field and addressing System Integration items that include but are not limited to: a) A complete listing of all Toll System switch settings b) A complete listing of any other hardware configuration parameters c) A complete listing of software configuration parameters d) Software installation, configuration and initialization instructions Each shall address all comments from the 100% Design Review to the Authority's satisfaction and be 100% complete.
TS-01 Requirement #4.2.7-19	The Installation-Ready Design Review Submittal shall include all installation checklists for use in the field and derived from the Infrastructure Documentation. Each shall address all comments from the 100% Design Review to the Authority's satisfaction and be 100% complete.
TS-01 Requirement #4.2.7-20	The Installation-Ready Design Review Submittal shall include the System Design Requirements document (see section 5.2 below). It shall address all comments from the 100% Design Review to the Authority's satisfaction; address all issues discovered by the Contractor subsequent to the 100% Design Review; and remain 100% complete.

Contract Criteria	
TS-01 Requirement #4.2.7-21	The Installation-Ready Design Review Submittal shall include the System Detailed Design document (see section 5.3 below). It shall address all comments from the 100% Design Review to the Authority's satisfaction; address all issues discovered by the Contractor subsequent to the 100% Design Review; and remain 100% complete.
TS-01 Requirement #4.2.7-22	The Installation-Ready Design Review Submittal shall include the Detailed Test Procedures document (see section 5.4 below) updated to reflect any changes in test procedures and any additional test procedures performed to validate changes in the hardware or software since the 100% Design Review was completed including but not limited to: a) The Factory Acceptance Test procedures b) The Revenue Service Acceptance Test procedures c) The Project Acceptance Test procedures
TS-01 Requirement #4.2.7-23	The Installation-Ready Design Review Submittal shall include all System Manuals (see sections 5.5.1 through 5.5.4 below). Each shall address all comments from the 100% Design Review to the Authority's satisfaction; address all issues discovered by the Contractor subsequent to the 100% Design Review; and remain 100% complete including the: a) System Administrator Manual b) Plaza Supervisor Manual c) Toll Collection Attendant manual d) System Maintenance Manual
TS-01 Requirement #4.2.7-24	The Installation-Ready Design Review Submittal shall include all Training Materials (see sections 5.6.1 through 5.6.3 below). Each shall address all comments from the 100% Design Review to the Authority's satisfaction; address all issues discovered by the Contractor subsequent to the 100% Design Review; and remain 100% complete including the: a) Instructor guides for the four (4) courses in section 8 below b) Training aids for the four (4) courses in section 8 below c) Student workbooks for the four (4) courses in section 8 below
TS-01 Requirement #4.2.7-25	The Contractor shall provide all of the documents above in two (2) electronic versions, where one version reflects changes from the previous submittal as markups ("red lines") and the other version is in clean form.
TS-01 Requirement #4.2.7-26	The Contractor's management team, Key Staff and an employee of each subcontractor shall attend the comment review meeting(s) for the documents and drawings above.
TS-01 Requirement #4.2.7-27	The Contractor shall revise the documents and drawings above as necessary for the Authority to declare each document or drawing above as "approved-in-principle" for the specified level of completeness.
TS-01 Requirement #4.2.7-28	The Contractor shall complete and provide receipts to the Authority for the escrow of software (see the TS-02 document) just prior to successful completion of the Installation-Ready Design Review Milestone.

Contract Criteria	
TS-01 Requirement #4.2.7-29	Prior to successful completion of the Installation-Ready Design Review Milestone, the Contractor shall provide the Authority with an updated complete list of the information needs and decisions required from the Authority to keep the project on schedule.

4.2.8. System Installation

Installation requirements are detailed in Tolling Specification #03. The following only describes the work sequence requirements for installation related to other Contract activities.

Contract Criteria	
TS-01 Requirement #4.2.8-1	On-site work by the Contractor shall be limited to field surveys (section 11.2 below) and meetings prior to successful completion of the Installation-Ready Design Review.
TS-01 Requirement #4.2.8-2	The Contractor shall successfully complete the Installation-Ready Design Review Milestone (see section 4.2.7 above) prior to commencing installation.
TS-01 Requirement #4.2.8-3	Prior to successful completion of System Installation Milestone, the Contractor shall provide copies of the completed field use installation checklists addressing System Integration items that include but are not limited to: a) A complete listing of all Toll System switch settings b) A complete listing of any other hardware configuration parameters c) A complete listing of software configuration parameters d) Software installation, configuration and initialization instructions
TS-01 Requirement #4.2.8-4	Prior to successful completion of the System Installation Milestone, the Contractor shall provide copies of the completed field use installation checklists derived from the Infrastructure Documentation.

4.2.9. Revenue Service Acceptance Test Milestone

This milestone occurs at the successful completion of Revenue Service Acceptance Test, as solely determined by the Authority. Successful completion of this milestone affirms that revenue collection is being performed correctly by the Toll System at the Authority's facilities and related services.

Contract Criteria	
TS-01 Requirement #4.2.9-1	The Contractor shall, to the Authority's satisfaction, successfully complete all installation (section 4.2.8 above) prior to commencing the work described below.

Contract Criteria	
TS-01 Requirement #4.2.9-2	Fourteen (14) calendar days prior to the start of Revenue Service Acceptance Test, the Contractor shall provide an updated list of all COTS equipment and all firmware changes released by the respective manufacturer and a detailed description of which will be applied to the Toll System equipment installed at the Authority's facilities.
TS-01 Requirement #4.2.9-3	Fourteen (14) calendar days prior to the start of Revenue Service Acceptance Test, the Contractor shall provide an updated list of all COTS software and all new versions, patches and fixes released by the respective manufacturer and a detailed description of which will be installed on the Toll System.
TS-01 Requirement #4.2.9-4	Fourteen (14) calendar days prior to the start of Revenue Service Acceptance Test, the Contractor shall provide the original equipment manufacturer's report regarding the tuning and certification of automatic vehicle identification equipment (described in the TS-05 document) at all locations.
TS-01 Requirement #4.2.9-5	Fourteen (14) calendar days prior to the start of Revenue Service Acceptance Test, the Contractor shall electronically provide to the Authority a copy of all checklists, forms and other means that will be used to manually record Revenue Service Acceptance Test observations and results.
TS-01 Requirement #4.2.9-6	The Contractor shall repeat Revenue Service Acceptance Test in its entirety until the Authority is satisfied that the Toll System meets all described requirements.
TS-01 Requirement #4.2.9-7	The Contractor's management team, Key Staff and an employee of each subcontractor shall attend a working meeting to review Revenue Service Acceptance Test observations.
TS-01 Requirement #4.2.9-8	The Contractor shall provide all materials for and conduct at least one session of each training course described in section 8 below prior to successful completion of the Revenue Service Acceptance Test Milestone.
TS-01 Requirement #4.2.9-9	The Contractor shall complete and provide receipts to the Authority for the escrow of software (see the TS-02 document) just prior to successful completion of the Revenue Service Acceptance Test Milestone.
TS-01 Requirement #4.2.9-10	Prior to successful completion of the Revenue Service Acceptance Test Milestone, the Contractor shall provide the Authority with an updated complete list of the information needs and decisions required from the Authority to keep the project on schedule.

Requirements specific to conducting Revenue Service Acceptance Test are detailed in section 7 below.

Requirements for the management of Revenue Service Acceptance Test activities are detailed in section 4.3.8 below.

4.2.10. Project Acceptance Test Milestone

This milestone occurs at the successful completion of Project Acceptance Test, as solely determined by the Authority. Successful completion of this milestone further affirms that the Toll System is meeting the Authority's requirements and that related services are being provided appropriately.

Contract Criteria	
TS-01 Requirement #4.2.10-1	The Contractor shall successfully complete Revenue Service Acceptance Test (section 4.2.9 above) to the Authority's satisfaction and then operate the Toll System for three (3) months without incident prior to commencing the following work.
TS-01 Requirement #4.2.10-2	Fourteen (14) calendar days prior to the start of Project Acceptance Test, the Contractor shall review reporting history with the Authority regarding the Contractor's obligation to keep an updated list of all COTS equipment and all firmware changes released by the respective manufacturer and a detailed description of their installation status and history.
TS-01 Requirement #4.2.10-3	Fourteen (14) calendar days prior to the start of Project Acceptance Test, the Contractor shall review reporting history with the Authority regarding the Contractor's obligation to keep an updated list of all COTS software and all new versions, patches and fixes released by the respective manufacturer and a detailed description of their installation status and history.
TS-01 Requirement #4.2.10-4	Fourteen (14) calendar days prior to the start of Project Acceptance Test, the Contractor shall electronically provide to the Authority a copy of all checklists, forms and other means that will be used to manually record Project Acceptance Test observations and results.
TS-01 Requirement #4.2.10-5	The Contractor shall repeat Project Acceptance Test in its entirety until the Authority is satisfied that the Toll System meets all described requirements.
TS-01 Requirement #4.2.10-6	The Contractor's management team, Key Staff and an employee of each subcontractor shall attend a working meeting to review Project Acceptance Test observations.
TS-01 Requirement #4.2.10-7	The Contractor shall complete and provide receipts to the Authority for the escrow of software (see the TS-02 document) just prior to successful completion of the Project Acceptance Test Milestone.

Requirements specific to conducting Project Acceptance Test are detailed in section 7 below.

Requirements for the management of Project Acceptance Test activities are detailed in section 4.3.8 below.

4.2.11. As-Built Review Milestone
This milestone is pre-requisite to project acceptance.

Contract Criteria	
TS-01 Requirement #4.2.11-1	The Contractor shall successfully complete the Project Acceptance Test Milestone (see section 4.2.10 above) to the Authority's satisfaction prior to commencing the following work.
TS-01 Requirement #4.2.11-2	The Contractor shall develop and provide a Submittal as detailed in section 4.6 of this TS-01 document and meeting all requirements described below (hereafter the As-Built Review Submittal) at least twenty-one (21) calendar days prior to the scheduled successful completion of the As-Built Review Milestone. The Contractor is encouraged to make partial deliveries much earlier than the twenty-one (21) day deadline to avoid creating a backlog in the Authority's review and comment process and corresponding delays.
TS-01 Requirement #4.2.11-3	The As-Built Review Submittal shall include the Management Plan (see section 4.3 below).
TS-01 Requirement #4.2.11-4	This Management Plan shall include a Progress Schedule updated to reflect the then-current status.
TS-01 Requirement #4.2.11-5	This Management Plan shall contain a Bill Of Materials that remains complete and is updated to address all Authority comments from the Installation-Ready Design Review and all issues discovered during the Contractor's design process.
TS-01 Requirement #4.2.11-6	This Management Plan shall contain a Bill Of Materials that is also updated to reflect the then-current Toll System installation at the Authority's facilities and spare parts stocking.
TS-01 Requirement #4.2.11-7	The As-Built Review Submittal shall include a list of all COTS equipment and all firmware changes released by the respective manufacturer and a detailed description of which are applied to Toll System equipment at the Authority's facilities.
TS-01 Requirement #4.2.11-8	The As-Built Review Submittal shall include a list of all COTS software and all new versions, patches and fixes released by the respective manufacturer and a detailed description of which are applied to the Toll System.
TS-01 Requirement #4.2.11-9	The As-Built Review Submittal shall include Detailed Design Calculations in electronic form (see section 11.3.1 below) that are 100% complete, updated such that they address all Authority comments from the Installation-Ready Design Review and reflect the then-current condition of the Toll System.

Contract Criteria	

TS-01 Requirement #4.2.11-10	The As-Built Review Submittal shall include these Detailed Design Calculations in hardcopy form as follows:
	
	   a) One (1) bound paper copy printed double-sided, on quality paper cut to 8.5" by 11" size
	
	   b) One (1) unbound paper copy printed single-sided, on quality paper cut to 8.5" by 11" size and easily reproducible within the Authority
	
	The Engineer Of Record shall sign and emboss the cover sheet of all such paper copies with their seal.

TS-01 Requirement #4.2.11-11	The As-Built Review Submittal shall include Detailed Design Specifications in electronic form (see section 11.3.2 below) that are 100% complete, updated such that they address all Authority comments from the Installation-Ready Design Review and reflect the then-current condition of the Toll System.

TS-01 Requirement #4.2.11-12	The As-Built Review Submittal shall include these Detailed Design Specifications in hardcopy form as follows:
	
	   a) One (1) bound paper copy printed double-sided, on quality paper cut to 8.5" by 11" size
	
	   b) One (1) unbound paper copy printed single-sided, on quality paper cut to 8.5" by 11" size and easily reproducible within the Authority
	
	The Engineer Of Record shall sign and emboss the cover sheet of all such paper copies with their seal.

TS-01 Requirement #4.2.11-13	The As-Built Review Submittal shall include Detailed Design Drawings in electronic form (see section 11.3.3 below) that are 100% complete, updated such that they address all Authority comments from the Installation-Ready Design Review and reflect the then-current condition of the Toll System.
TS-01 Requirement #4.2.11-14	The As-Built Review Submittal shall include one (1) complete set of these Detailed Design Drawings on black-line Mylar that is a minimum of 2 mil thick, double-matte and cut to 34" x 44" size. The Engineer Of Record shall emboss all such Mylar sheets with their seal and rub the embossment with carbon paper, or an alternative method with similar characteristics shall be used, so that the seal will be visible on all prints made from said Mylar sheets.
TS-01 Requirement #4.2.11-15	The As-Built Review Submittal shall include Shop Drawings (see section 11.3.4 below) in electronic form that are 100% complete, updated such that they address all Authority comments from the Installation-Ready Design Review and reflect the then-current condition of the Toll System.

Contract Criteria	

TS-01 Requirement #4.2.11-16	The As-Built Review Submittal shall include these Shop Drawings in hardcopy form as follows:
	
	    a) One (1) bound paper copy printed double-sided, on quality paper
	    b) One (1) unbound paper copy printed single-sided, on quality paper and easily reproducible within the Authority
	
	The Engineer Of Record shall sign and emboss the cover sheet of all such paper copies with their seal.

TS-01 Requirement #4.2.11-17	The As-Built Review Submittal shall include copies of the 100% complete field use installation checklists addressing System Integration items with updates that reflect the then-current condition of the Toll System including but are not limited to:
	
	    a) A complete listing of all Toll System switch settings
	    b) A complete listing of any other hardware configuration parameters
	    c) A complete listing of software configuration parameters
	    d) Software installation, configuration and initialization instructions

TS-01 Requirement #4.2.11-18	The As-Built Review Submittal shall include 100% complete field use installation checklists derived from the Infrastructure Documentation and updated to reflect the then-current condition of the Toll System.
TS-01 Requirement #4.2.11-19	The As-Built Review Submittal shall include the System Design Requirements document (see section 5.2 below) that is 100% complete, updated such that it addresses all Authority comments from the Installation-Ready Design Review and reflects the then-current condition of the Toll System.
TS-01 Requirement #4.2.11-20	The As-Built Review Submittal shall include the System Detailed Design document (see section 5.3 below) that is 100% complete, updated such that it addresses all Authority comments from the Installation-Ready Design Review and reflects the then-current condition of the Toll System.

TS-01 Requirement #4.2.11-21	The As-Built Review Submittal shall include the Detailed Test Procedures document (see section 5.4 below) updated to reflect any changes in test procedures and any additional test procedures performed to validate changes in the hardware or software since Installation-Ready Design Review was completed including but not limited to:
	
	    a) The Factory Acceptance Test procedures
	    b) The Revenue Service Acceptance Test procedures
	    c) The Project Acceptance Test procedures

Contract Criteria	
TS-01 Requirement #4.2.11-22	The As-Built Review Submittal shall include System Manuals (see sections 5.5.1 through 5.5.4 below) updated such that they address all comments from the Installation-Ready Design Review; they address all issues discovered through testing or use subsequent to the Installation-Ready Design Review; and they are 100% complete including the: a) System Administrator Manual b) Plaza Supervisor Manual c) Toll Collection Attendant Manual d) System Maintenance Manual
TS-01 Requirement #4.2.11-23	The As-Built Review Submittal shall include Training Materials (see sections 5.6.1 through 5.6.3 below) updated such that they address all comments from the Installation-Ready Design Review; they address all issues discovered through testing or use subsequent to the Installation-Ready Design Review; and they are 100% complete including the: a) Instructor guides for the four (4) courses in section 8 below b) Training aids for the four (4) courses in section 8 below c) Student workbooks for the four (4) courses in section 8 below
TS-01 Requirement #4.2.11-24	The Contractor shall revise the documents and drawings above as necessary for the Authority to declare each document or drawing above as "approved-in-principle".
TS-01 Requirement #4.2.11-25	The Contractor shall provide all of the documents above in two (2) electronic versions, where one version reflects changes from the previous submittal as markups ("red lines") and the other version is in clean form.

4.2.12. Capital Project Close-out Milestone

This is the final milestone in the capital project.

Contract Criteria	
TS-01 Requirement #4.2.12-1	The Contractor shall successfully complete the As-Built Review Milestone (see section 4.2.11 above) and resolve all punch list items prior to close-out of the capital project. The Contractor shall successfully achieve Capital Project Close-out once the Project Acceptance Test Milestone (see section 4.2.10 above) and As-Built Review Milestone has been achieved (see section 4.2.11 above) prior to close-out of the capital project.
TS-01 Requirement #4.2.12-2	The Contractor shall complete and provide receipts to the Authority for the escrow of software (see the TS-02 document) just prior to successful completion of the Capital Project Close-Out Milestone.
TS-01 Requirement #4.2.12-3	The Contractor shall obtain the bonding required after close-out of the capital project (see Contract terms and conditions) and provide documentation of such bonding to the Authority in a form the Authority deems acceptable.

4.3. Management Plan

Proposal Criteria
The Offeror shall include in their proposal a summary of no more than one page-side, describing their approach to developing and updating management documentation and how this approach will address the requirements below.
The Offeror shall state in their proposal whether separate documents will be maintained for each of the requirements in this section 4.3 of TS-01; shall reflect all document approval and control procedures; and shall address the review cycles and related schedule dependencies.
The Offeror shall include in their proposal a Progress Schedule, as directed by the RFP, in Gantt Chart format and showing the Critical Path(s) identified during the Offeror's initial analysis.

The Contractor shall develop and furnish a comprehensive Management Plan as described below.

Contract Criteria	
TS-01 Requirement #4.3-1	The Management Plan shall contain an executive summary that describes all significant features of the Contractor's approach toward the management of the project team and resources of the project and the Contractor's overall technical approach to the entire project.
TS-01 Requirement #4.3-2	The Management Plan shall provide a detailed description of the Contractor's project management methodology and procedures. This description shall include the process, personnel and mechanisms that the Contractor will use to identify all issues and concerns early in the project and then formulate and successfully execute plans to resolve such issues and concerns.
TS-01 Requirement #4.3-3	The Management Plan shall provide a detailed description of the Engineer Of Record's assessment, design, review, and oversight processes.
TS-01 Requirement #4.3-4	The Contractor shall submit the Management Plan to the Authority in electronic form consisting of source files in .DOCX (compatible with Microsoft Word 2010) or .XLSX (compatible with Microsoft Excel 2010).
TS-01 Requirement #4.3-5	The Contractor shall submit the Management Plan to the Authority in electronic form consisting of a copy of each source file above after conversion to .PDF format for printing on 8.5" by 11" paper.

4.3.1. Management Approach

The following details the aspects of the management approach that the Management Plan must address.

Contract Criteria	
TS-01 Requirement #4.3.1-1	The Management Plan shall contain a section labeled "Project Management Approach".
TS-01 Requirement #4.3.1-2	Such plan section shall describe the Contractor's approach to project management sufficiently to enable the Authority to review and confirm that the Contractor has the necessary management, staff, and controls in place to meet the requirements of the Contract
TS-01 Requirement #4.3.1-3	Such plan section shall include an Organization Chart identifying all Key Staff (see section 4.1 above) and showing the reporting structure used in this Contract.
TS-01 Requirement #4.3.1-4	Such plan section shall describe how the Contractor plans to manage staffing, scheduling and communication procedures for controlling all correspondence, submittals, and other communications between the Contractor and the Authority, communications with the Engineer Of Record and communications with the operator of the VDOT E-ZPass Customer Service Center, civil contractors and other third parties.
TS-01 Requirement #4.3.1-5	Such plan section shall describe how the Contractor plans to document invoice submission; provide invoice backup information; and support the Authority's verification and approval process.
TS-01 Requirement #4.3.1-6	Such plan section shall contain samples of all forms including but not limited to: a) Meeting agendas b) Documentation of agreements reached in meetings c) Action items tracking log d) Monthly progress report e) Invoices
TS-01 Requirement #4.3.1-7	Such plan section shall include a sample comments sheet and describe the Contractor's process for validating that all comments provided by the Authority on Contractor deliverables are successfully addressed.

4.3.2. Progress Schedule

The following details the aspects of the schedule that the Management Plan must address.

Contract Criteria	
TS-01 Requirement #4.3.2-1	The Management Plan shall contain a section labeled "Progress Schedule".

Contract Criteria	
TS-01 Requirement #4.3.2-2	Such plan section shall contain a Progress Schedule depicting how the Contractor will manage and coordinate all of its work and deliverables specified in this TS-01 document and all of the other Tolling Specifications (TS) documents so as to successfully mitigate risk and achieve the milestone dates specified by the Authority.
TS-01 Requirement #4.3.2-3	The Progress Schedule shall be created and maintained using Microsoft Project 2010 or a newer version of Microsoft Project as approved by the Authority.
TS-01 Requirement #4.3.2-4	The Progress Schedule shall show all resources and their availability and loading.
TS-01 Requirement #4.3.2-5	The Progress Schedule shall clearly show the sequence of all work under this Contract, including but not limited to: a) Toll System requirements, design, development and documentation tasks b) Toll System infrastructure design and construction tasks, including Engineer Of Record tasks c) Toll System training classes d) Toll System installation tasks e) Toll System testing tasks
TS-01 Requirement #4.3.2-6	The Progress Schedule shall clearly show the sequence of all Submittals, Milestone Reviews, Testing and Installation for each part of this Contract.
TS-01 Requirement #4.3.2-7	The first draft of the Progress Schedule approved by the Authority after execution or amendment of the Contract shall be the baseline schedule.
TS-01 Requirement #4.3.2-8	The Contractor shall prepare and submit an updated Progress Schedule to the Authority at every progress meeting (see section 4.4.2 below) and as part of the management plan in accordance with the milestone requirements (see section 4.2 above). Each such updated Progress Schedule shall: a) Show the baseline schedule dates for each milestone as originally approved by the Authority b) Reflect updated resource availability and loading c) Provide a complete outline of all tasks and activities required for the successful execution of each project under this Contract and resulting milestone dates d) Clearly show all critical path tasks and activities and be accompanied by a written report by the Project Manager detailing their analysis of the critical schedule paths and their assessment of available mitigation plans.

4.3.3. Quality

The following details the aspects of quality that the Management Plan must address.

Contract Criteria	
TS-01 Requirement #4.3.3-1	The Management Plan shall contain a section labeled "Quality Management".
TS-01 Requirement #4.3.3-2	Such plan section shall describe the Quality Manager's responsibilities and authority; identify the individuals employed by the Contractor to oversee the quality program; and identify any additional training they will require.
TS-01 Requirement #4.3.3-3	Such plan section shall detail the Contractor's quality program and the procedures of each process in the Contractor's quality program.
TS-01 Requirement #4.3.3-4	Such plan section shall describe the Contractor's process for managing and overseeing activities related to any other quality requirements including but not limited to those identified in section 4.7 below and the TS-02 document.

4.3.4. Security

The following details the aspects of security that the Management Plan must address.

Contract Criteria	
TS-01 Requirement #4.3.4-1	The Management Plan shall contain a section labeled "Security Management".
TS-01 Requirement #4.3.4-2	Such plan section shall detail the Contractor's approach to personnel security under this Contract.
TS-01 Requirement #4.3.4-3	Such plan section shall detail the Contractor's approach to physical security (e.g. facility, tools, equipment, etc.) under this Contract.

Contract Criteria	
TS-01 Requirement #4.3.4-4	Such plan section shall detail the Contractor's approach to data security under this Contract. Such detail shall describe which of the following items are fully automated, which require manual oversight and intervention, the degree of manual oversight and intervention required after the Toll System is installed at the Authority's facilities and each party responsible for such oversight and intervention: • Firewalls • Virtual private networks • Intrusion detection and prevention • Unauthorized access detection and prevention • Virus protection • Spam protection • Denial-of-service attack protection
TS-01 Requirement #4.3.4-5	Such plan section shall detail how the Contractor will remotely access, analyze, perform manual data entry and load software onto the Toll System and all measures that the Contractor shall take to: a) Maintain network security such that no virus or malware is introduced to the Toll System b) Prevent any copies or other unauthorized use of Toll System data
TS-01 Requirement #4.3.4-6	Such plan section shall identify the individuals employed by the Contractor to perform each data security procedure and any additional training they will require.
TS-01 Requirement #4.3.4-7	Such plan section shall identify the individuals employed by the Contractor to oversee the data security aspects of the security program and any additional training they will require.
TS-01 Requirement #4.3.4-8	Such plan section shall identify the individuals employed by the Contractor to perform ad hoc and scheduled audits of each data security procedure and any additional training they will require.
TS-01 Requirement #4.3.4-9	Such plan section shall detail and show the party responsible for all activities necessary to comply with the Commonwealth of Virginia security requirements that are available at: http://www.vita.virginia.gov/library/default.aspx?id=537#securityPSGs Such activities shall include, at a minimum a. An initial information security risk assessment of the Toll System solution b. Backup of the Toll System c. Recovery of the Toll System d. Other contingency plans related to the Toll System and supporting services

Additional security requirements include but are not limited to those specified in section 4.8 below; in sections 5.1.2 and 5.1.3 below; and in the TS-02 document.

4.3.5. Configuration & Change Management

The following details the aspects of configuration and change management that the Management Plan must address.

Contract Criteria	
TS-01 Requirement #4.3.5-1	The Management Plan shall contain a section labeled "Configuration and Change Management".
TS-01 Requirement #4.3.5-2	The Contractor shall employ a comprehensive configuration and change management program.
TS-01 Requirement #4.3.5-3	Such plan section shall detail the Contractor's approach to configuration and change management under this Contract. Such plan section shall describe the Contractor's process for effectively tracking and managing all software corrections, engineering changes, COTS software release levels, COTS software patches and other changes subsequent to the design baseline being established as described above.

TS-01 Requirement #4.3.5-4	Such plan section shall detail the processes and procedures that the Contractor will use to:
	
	a) Establish a baseline design of the Toll System prior to Factory Acceptance Test
	
	b) Notify the Authority of any proposed design change to the Toll System
	
	c) Test each proposed design change to the Toll System
	
	d) Obtain Authority approval of any proposed design change to the Toll System and for changes that are:
	
	  o Approved in writing by the Authority, ensure that the Factory Acceptance Test installation and/or installations of the Toll System at the Authority's facilities are changed in accordance with the Authority's approval
	
	  o Not approved in writing by the Authority, ensure the Factory Acceptance Test installation and any installation of the Toll System at the Authority's facilities remain unchanged
	
	e) Update all affected documentation and the software escrow to reflect any design change

TS-01 Requirement #4.3.5-5	Such plan section shall detail the procedure and roles of the various Contractor staff members in the review of the System Design Document and the Contractor's method of conveying the results of this review when they notify the Authority of any proposed change.

Contract Criteria	
TS-01 Requirement #4.3.5-6	Such plan section shall detail the procedure and roles of the various Contractor staff members in the review of Toll System test procedures and the Contractor's method of conveying the results of this review when notifying the Authority of any proposed change.
TS-01 Requirement #4.3.5-7	Such plan section shall detail the procedure, the roles of Contractor staff and the role of the Engineer Of Record in the review of Detailed Design Calculations, Detailed Design Specifications, Detailed Design Drawings and Shop Drawings as part of any proposed change.
TS-01 Requirement #4.3.5-8	Such plan section shall identify the individuals employed by the Contractor to oversee configuration and change management and any additional training they will require.
TS-01 Requirement #4.3.5-9	Such plan section shall detail the Contractor's process for ensuring that all COTS software utilized by the Toll System is maintained at fully supported versions from their original manufacturers for the duration of the Contract.
TS-01 Requirement #4.3.5-10	Such plan section shall detail the Contractor's process for identifying all patches and software updates to COTS software necessary to maintain the required levels of security and functionality and immediately notifying the Authority whenever any update or patch is released by the manufacturer.
TS-01 Requirement #4.3.5-11	Such plan section shall detail the Contractor's process for determining the appropriate extent of software testing required for patches and software updates to COTS software, reporting such determination and conducting such testing prior to patches and software updates being applied to Toll System equipment installed at the Authority's facilities.

Additional configuration and change management requirements are specified in section 4.9 below and in the TS-02 document.

4.3.6. Software Development
The following details the aspects of software development that the Management Plan must address.

Contract Criteria	
TS-01 Requirement #4.3.6-1	The Management Plan shall contain a section labeled "Software Development".
TS-01 Requirement #4.3.6-2	Such plan section shall describe the Contractor's overall technical approach and the framework used for software development including but not limited to application architecture, behavior, business processes, security measures and data structures.

Contract Criteria	
TS-01 Requirement #4.3.6-3	Such plan section shall describe the Contractor's software lifecycle approach to managing the necessary interfaces between various System development disciplines including but not limited to software developers; system engineers; test engineers; Quality Assurance personnel; configuration and change management administrator; documentation specialists; project management staff; third parties for interfaces with external systems; and software maintenance personnel.
TS-01 Requirement #4.3.6-4	Such plan section shall describe the Contractor's problem reporting and tracking.
TS-01 Requirement #4.3.6-5	Such plan section shall describe the Contractor's process for preliminary testing by development staff including but not limited to regression, function, performance and recovery testing.
TS-01 Requirement #4.3.6-6	Such plan section shall describe the Contractor's: a) Software development standards b) Security standards c) Software development methodology such as use cases, modeling and other development tools d) Software development language strategy, platforms and technologies related to both development and software maintenance e) Approach to segregation of environments (development, testing and deployment) and the number of environments f) Maintenance of standard and baseline code bases and management of major releases g) Gap analysis of baseline code h) Code reviews and code development standards i) Source code control j) Regression testing and security and vulnerability testing k) Development and integration approach for the major functional modules l) Software quality control processes m) Software end-user documentation usability review n) Development documentation o) Technical software code documentation for all code p) Software configuration and change management approach q) Samples of detailed software documentation for both external and in-line documentation r) Detailed documentation of the development environment, including enough information that the environment could be completely replicated
TS-01 Requirement #4.3.6-7	Such plan section shall describe the Contractor's software release process including but not limited to source code, compilers and the process for loading and verifying machine code.

Contract Criteria	
TS-01 Requirement #4.3.6-8	Such plan section shall describe the Contractor's other activities pertinent to delivering Toll System software.

Additional software submittal requirements are specified in section 5.1.1 below.

4.3.7. Data Migration

The following details the aspects of data migration that the Management Plan must address.

Contract Criteria	
TS-01 Requirement #4.3.7-1	The Management Plan shall contain a section labeled "Data Migration".
TS-01 Requirement #4.3.7-2	Such plan section shall describe an approach to migrating data and operations to the Toll System and related Contract work that it is seamless to customers and has minimal impact on existing operations.
TS-01 Requirement #4.3.7-3	Such plan section shall provide a detailed description of all tools and training necessary to map, check, clean, copy and migrate historic data.
TS-01 Requirement #4.3.7-4	Such plan section shall contain a detailed mapping of tables and fields used in the Toll System. This mapping shall identify exceptions and anomalies in the data structure of the existing toll system; clearly describe how such exceptions/anomalies are addressed; clearly define any data transformations that are required, any data summarizations that are required; and any other data manipulations that are required.
TS-01 Requirement #4.3.7-5	Such plan section shall clearly define all existing toll system information the Contractor will need for development and testing.
TS-01 Requirement #4.3.7-6	Such plan section shall identify each type of existing toll system data the Contractor will load on the Toll System, whether each type involves a copy of the data or data migration, how it is checked and cleaned and transformed, where it is loaded, how it is loaded, when it is loaded, approximately how long each step of this process will take and if more than one repetition of a process part is anticipated.
TS-01 Requirement #4.3.7-7	Such plan section shall clearly define the sequence of any data migration (i.e. which tables must be migrated in which order to ensure data integrity) by providing a detailed timeline showing each step in the migration process, responsible parties, expected durations, data validation points, etc. Such plan section shall similarly define the sequence and timeline of rollback activities.
TS-01 Requirement #4.3.7-8	Such plan section shall clearly define the method that the Contractor will use to test and validate data migration prior to actual cutover.

Contract Criteria	
TS-01 Requirement #4.3.7-9	Such plan section shall contain detailed migration validation procedures, queries, reports and any other tools necessary to demonstrate that the migration was completed successfully. The plan shall: a) Describe how these validation tools clearly highlight unexpected results and exceptions and the steps required to mitigate same b) Outline testing and the eventual Detailed Test Procedures that will be performed as part of Revenue Service Acceptance Test and Project Acceptance Test to verify that data was properly migrated from the toll system currently installed.
TS-01 Requirement #4.3.7-10	Such plan section shall provide a detailed data migration schedule that identifies all tasks required of the Authority, the Contractor and all involved parties starting from the development of the plan to execution and successful completion of the Revenue Service Acceptance Test milestone.
TS-01 Requirement #4.3.7-11	Such plan section shall provide data migration team organizational structure, organizational chart, and job descriptions and responsibilities.
TS-01 Requirement #4.3.7-12	Such plan section shall provide risks and contingency planning that is broken into manageable options such that at critical phases the progress can be evaluated.
TS-01 Requirement #4.3.7-13	Such plan section shall include but is not limited to: • Comprehensive analysis of existing toll system data • Identification of functionality and data to be migrated and any functionality and data that will not be migrated • Identification of any data migration shortcomings and deficiencies including proposed solutions • Detailed data mapping between the existing toll system and the Toll System database(s) • Identification of any cleansing and pre-processing that need to be performed on the data prior to its migration • Validation and verification process for the migrated data at critical phases of the migration • Detailed data migration checklist, responsible person, and decision process for prior to and during live traffic testing
TS-01 Requirement #4.3.7-14	Such plan section shall also include all of the trial migrations to be conducted where the entire migration and validation process is exercised.
TS-01 Requirement #4.3.7-15	The Contractor shall modify the data migration processes in such plan section and repeat any associated pre-migration testing until the required parameters are met. For example, if testing shows that allowable system downtime is exceeded, the Contractor shall revise, re-submit and re-test the plan at the Contractor's expense such that the plan meets all criteria. Pre-migration testing shall be performed as many times as necessary to ensure that actual migration is completed without incident.

4.3.8. Testing

The following details the aspects of testing that the Management Plan must address.

Contract Criteria	
TS-01 Requirement #4.3.8-1	Such plan section shall contain a section labeled "Testing".
TS-01 Requirement #4.3.8-2	Such plan section shall describe the Test Manager's responsibilities and authority.
TS-01 Requirement #4.3.8-3	Such plan section shall describe the Quality Manager's role in each test phase.
TS-01 Requirement #4.3.8-4	Such plan section shall describe the Contractor's approach to testing under this Contract, all Toll System testing and the sequence and pre-requisites of a) Factory Acceptance Test b) Revenue Service Acceptance Test c) Project Acceptance Test
TS-01 Requirement #4.3.8-5	Such plan section shall describe the length, width and approximate locations of roadway, shoulders and gantries that the Contractor will use for Factory Acceptance Test.
TS-01 Requirement #4.3.8-6	Such plan section shall describe which lanes and shoulders at the Factory Acceptance Test installation will be equipped the same as when the Toll System is installed at the Authority's facilities and which will be different.
TS-01 Requirement #4.3.8-7	For Factory Acceptance Test, such plan section shall describe the types of vehicles that the Contractor will provide and operate, and the number of each.
TS-01 Requirement #4.3.8-8	For Factory Acceptance Test, such plan section shall describe the license plate issuing jurisdiction and license plate type of each such vehicle.
TS-01 Requirement #4.3.8-9	For Factory Acceptance Test, such plan section shall describe the types of E-ZPass transponders (e.g. interior standard, Flex, exterior) that the Contractor will provide and use, and the number of each.
TS-01 Requirement #4.3.8-10	For Factory Acceptance Test, such plan section shall describe where each such E-ZPass transponder will be mounted (e.g. windshield, front license plate, bus roof, etc.).
TS-01 Requirement #4.3.8-11	For Factory Acceptance Test, such plan section shall describe the documentation provided by the Contractor to the Authority showing details of the testing and results.

Contract Criteria	
TS-01 Requirement #4.3.8-12	For Factory Acceptance Test, such plan section shall detail the method by which test results will be assessed and the associated pass/fail criteria.
TS-01 Requirement #4.3.8-13	Such plan section shall specifically require that all Factory Acceptance Test procedures be repeated in their entirety each time that software, software patches, hardware, equipment firmware or configurable Toll System parameters change prior to successful completion of Factory Acceptance Test.
TS-01 Requirement #4.3.8-14	For Revenue Service Acceptance Test, such plan section shall specify sample sizes; the types and configurations of vehicles that the Contractor will provide and operate; the number of each; and the use of test vehicles vs. "live traffic".
TS-01 Requirement #4.3.8-15	For Revenue Service Acceptance Test, such plan section shall describe the types and configurations of vehicles that the Contractor will provide and operate, and the number of each.
TS-01 Requirement #4.3.8-16	For Revenue Service Acceptance Test, such plan section shall describe the issuing state and license plate type of each such vehicle.
TS-01 Requirement #4.3.8-17	For Revenue Service Acceptance Test, such plan section shall describe the types of E-ZPass transponders (e.g. interior standard, Flex, exterior) that the Contractor will provide and use, and the number of each.
TS-01 Requirement #4.3.8-18	For Revenue Service Acceptance Test, such plan section shall describe where each such E-ZPass transponder will be mounted (e.g. windshield, front license plate, bus roof, etc.).
TS-01 Requirement #4.3.8-19	For Revenue Service Acceptance Test, such plan section shall describe the documentation provided by the Contractor to the Authority showing details of the testing and results.
TS-01 Requirement #4.3.8-20	For Revenue Service Acceptance Test, such plan section shall detail the method by which test results will be assessed and the associated pass/fail criteria.
TS-01 Requirement #4.3.8-21	Such plan section shall specifically require that all Revenue Service Acceptance Test procedures be repeated in their entirety each time that software, software patches, hardware, equipment firmware or configurable Toll System parameters change prior to successful completion of Revenue Service Acceptance Test.
TS-01 Requirement #4.3.8-22	For Project Acceptance Test, such plan section shall describe the types and configurations of vehicles that the Contractor will provide and operate; the number of each; and the use of test vehicles vs. "live traffic". Test vehicle transponder types and programming; transponder mounting locations; and license plates shall be part of this description.
TS-01 Requirement #4.3.8-23	For Project Acceptance Test, such plan section shall describe the various levels of observation that the Contractor will perform; the observed parameters in each; and the sequence and hours of each.

Contract Criteria	
TS-01 Requirement #4.3.8-24	For Project Acceptance Test, such plan section shall describe the documentation provided by the Contractor to the Authority showing details of the testing and results.
TS-01 Requirement #4.3.8-25	For Project Acceptance Test, such plan section shall detail the method by which test results will be assessed and the associated pass/fail criteria.

Detailed test procedures are a separate deliverable as specified in section 5.4 below. Additional testing requirements are specified in section 7 below.

4.3.9. Training
The following details the aspects of training that the Management Plan must address.

Contract Criteria	
TS-01 Requirement #4.3.9-1	The Management Plan shall contain a section labeled "Training Plan".
TS-01 Requirement #4.3.9-2	Such plan section shall contain an overall description of the training program including but not limited to the: a) Names and descriptions of each training class b) Duration of each training class (hours/days) c) Purpose of each training class d) Intended student of each training class e) Minimum qualifications for personnel attending each training class f) Qualifications requirements for the trainer of each training class g) Training materials, including manuals, guides and other supporting items, and techniques to be used h) Required equipment i) Facility requirements

Additional training requirements are specified in section 8 below and in the TS-02 document.

4.3.10. Installation
The following details the aspects of installation that the Management Plan must address.

Contract Criteria	
TS-01 Requirement #4.3.10-1	The Management Plan shall contain a section labeled "Installation Management".

Contract Criteria	
TS-01 Requirement #4.3.10-2	Such plan section shall describe the Installation Manager's responsibilities and authority.
TS-01 Requirement #4.3.10-3	Such plan section shall describe the Test Manager's responsibilities at each installation.
TS-01 Requirement #4.3.10-4	Such plan section shall describe the Quality Manager's responsibilities at each installation.
TS-01 Requirement #4.3.10-5	Such plan section shall describe the Engineer Of Record's responsibilities at each installation.
TS-01 Requirement #4.3.10-6	Such plan section shall detail the work sequence of Toll System installation and associated quality assurance tasks.
TS-01 Requirement #4.3.10-7	Such plan section shall identify each party authorizing, performing, overseeing and observing each task in this work sequence.
TS-01 Requirement #4.3.10-8	Such plan section shall fully describe the relationship between all construction, installation, testing, training, and transition tasks for any and all elements of the Toll System in this work sequence.
TS-01 Requirement #4.3.10-9	Such plan section shall call out all VDOT E-ZPass Customer Service Center pre-requisites and dependencies in this work sequence.
TS-01 Requirement #4.3.10-10	Such plan section shall call out all infrastructure construction and other 3rd party pre-requisites and dependencies in this work sequence.
TS-01 Requirement #4.3.10-11	Such plan section shall detail how the Contractor shall set up the various worksites, storage areas, sanitary and other facilities as required by local or state law, or by regulation, and the subsequent demobilization and removal from the site of said equipment, hardware, appurtenances and the like upon completion of the work.
TS-01 Requirement #4.3.10-12	Such plan section shall contain checklists for all work on-site. These checklists shall detail those items required for the installation crew to complete the Toll System installation and become a part of all work processes during this work.
TS-01 Requirement #4.3.10-13	Such plan section shall detail how the Contractor shall authorize and accept responsibility for application of power to equipment, run all initial diagnostics and System generation programs necessary to provide a complete working Toll System, and authorize and accept responsibility for the Authority's use of the Toll System to collect toll revenue and process toll violations.

Additional installation requirements are specified in section 6 below.

4.3.11. Operations And Maintenance

The following details the aspects of operations and maintenance that the Management Plan must address.

Contract Criteria	
TS-01 Requirement #4.3.11-1	The Management Plan shall contain a section labeled "Operations and Maintenance".
TS-01 Requirement #4.3.11-2	Such plan section shall fully detail a well-defined methodology for managing operations and maintenance of the Toll System as a mission-critical system.
TS-01 Requirement #4.3.11-3	Such plan section shall describe the O&M Manager's responsibilities and authority both prior to and after the Authority fully releases the Performance Bond.
TS-01 Requirement #4.3.11-4	Such plan section shall describe the Test Manager's responsibilities related to operations and maintenance both prior to and after the Authority fully releases the Performance Bond.
TS-01 Requirement #4.3.11-5	Such plan section shall describe the Quality Manager's responsibilities related to operations and maintenance both prior to and after the Authority fully releases the Performance Bond.
TS-01 Requirement #4.3.11-6	Such plan section shall describe the Engineer Of Record's responsibilities related to operations and maintenance both prior to and after the Authority fully releases the Performance Bond.
TS-01 Requirement #4.3.11-7	Such plan section shall detail, for the period commencing at the start of revenue service and continuing through the end of the Maintenance Contract, all Contractor: - Monitoring of the Toll System - Oversight of; administration of; and intervention in the Toll System's automated processes - Processes and employees trained and responsible for the manual off-load of data from the Toll System - Processes and employees trained and responsible for software inventory - Processes and employees trained and responsible for documentation update - Processes and employees trained and responsible for maintaining and coordinating the support of third parties (as detailed in Tolling Specification #02) - Processes and employees trained and responsible for providing the required training and any additional training provided as Extra Work
TS-01 Requirement #4.3.11-8	Such plan section shall detail all manual processes performed by the Contractor related to counting, collecting and reconciling coin payments, the associated financial accounting and the associated performance reporting.

Contract Criteria	
TS-01 Requirement #4.3.11-9	Such plan section shall detail all manual processes performed by the Contractor related to sending E-ZPass transactions and violations to VDOT's E-ZPass Customer Service Center, the associated financial accounting and the associated performance reporting.
TS-01 Requirement #4.3.11-10	Such plan section shall detail all manual processes performed by the Contractor related to reviewing or further researching E-ZPass transactions and violations as requested by VDOT's E-ZPass Customer Service Center.
TS-01 Requirement #4.3.11-11	Such plan section shall detail all manual processes performed by the Contractor related to assisting VDOT's E-ZPass Customer Service Center in the collection and adjudication processes.
TS-01 Requirement #4.3.11-12	Such plan section shall detail, for the period commencing at the start of revenue service and continuing through the end of the Maintenance Contract, all Contractor: a) Notification/communications procedures b) Fault monitoring procedures c) Remote diagnostic processes/procedures d) Maintenance Of Traffic procedures e) Spare parts inventory procedures
TS-01 Requirement #4.3.11-13	Such plan section shall contain a comprehensive preventive maintenance schedule. Said schedule shall: - List all preventive maintenance to be performed on each element of the Toll System - Specify the frequency and duration of all traditional lane, partial ORT zone and full ORT zone closures required each month to perform these activities - Specify the frequency and duration of all Host Subsystem outages required each year to perform these activities
TS-01 Requirement #4.3.11-14	Such plan section shall detail how to access the preventive maintenance schedule via the Toll System's MOMS functions, review alerts, review pending tasks, update tasks in process and mark tasks complete.
TS-01 Requirement #4.3.11-15	Such plan section shall identify the maintenance personnel and their specialties needed to maintain the Toll System as required. The plan shall also identify all subcontractor activities, if any, and the controls that will be in place to ensure subcontractor performance.
TS-01 Requirement #4.3.11-16	Such plan section shall describe all Contractor operations and maintenance reporting related activities and who will perform them, including but not limited to those required by Tolling Specification #02.
TS-01 Requirement #4.3.11-17	Such plan section shall describe all on-going Toll System testing and certification related activities and who will perform them, including but not limited to those required by Tolling Specification #02.

Contract Criteria	
TS-01 Requirement #4.3.11-18	Such plan section shall identify the section(s) of the System Manuals (further detailed in section 5.5 below) that describe how to access and use the Toll System functions that track and record the performance of the work above.

Additional requirements for operations and maintenance services are specified in section 9 below and in the TS-02 document.

4.3.12. Bill Of Materials

Contract Criteria	
TS-01 Requirement #4.3.12-1	The Management Plan shall contain a section labeled "Bill Of Materials".
TS-01 Requirement #4.3.12-2	The Bill Of Materials shall identify all assemblies that service personnel will troubleshoot and replace as a unit in the field ("field replaceable units).
TS-01 Requirement #4.3.12-3	The Bill Of Materials shall detail the following for each field replaceable unit and each equipment element that the Contractor will use in bench repair: a) A primary source listing the manufacturer; manufacturer address and telephone number; manufacturer make, model number, part number and version; manufacturer serial numbers that are on-site at the Authority's facilities and the identifiers of all engineering changes that were applied to each (subsequent to their original manufacture) b) A secondary source listing the manufacturer; manufacturer address and telephone number; manufacturer make, model number, part number and version; manufacturer serial numbers that are on-site at the Authority's facilities and the identifiers of all engineering changes that were applied to each (subsequent to their original manufacture) c) The quantity currently installed and planned for installation at the Authority's facilities for this project d) The recommended quantity of spares to be maintained at the Authority's facilities for this project e) The quantity currently in stock as spares or otherwise available but not installed at the Authority's facilities for this project f) Any support agreement or other agreements related to maintenance of such field replaceable unit, or its sub-assemblies, with original equipment manufacturers and other firms
TS-01 Requirement #4.3.12-4	The Bill Of Materials shall reflect the current design with confirmed quantities and prices.

Contract Criteria	
TS-01 Requirement #4.3.12-5	The Bill Of Materials shall include a section listing recommended spare quantities of each field replaceable units; recommended quantities of each equipment element that the Contractor will use in bench repair; and the current lead time required for receiving additional quantities of each.
TS-01 Requirement #4.3.12-6	The Bill Of Materials shall reflect and track any changes since its submission as part of the Contractor's proposal.

4.4. Meetings

The Contractor shall employ effective techniques, methodologies and tools to develop system requirements, business rules and other aspects of the project necessary to successfully complete all work under the Contract. Meetings are a vital aspect of these techniques and methodologies.

Contract Criteria	
TS-01 Requirement #4.4-1	Prior to conducting any workshops, reviews, focus group meetings and/or design reviews, the Contractor shall develop the necessary documentation for the Authority to review, submitted seven (7) working days prior to such meeting.
TS-01 Requirement #4.4-2	Such necessary documentation shall always include but is not limited to a comprehensive list of items requiring action (i.e. the "action items list") and this list shall be in a form acceptable to the Authority.
TS-01 Requirement #4.4-3	The Contractor shall document all meeting discussions in draft meeting minutes, in a form acceptable to the Authority, and distribute all such drafts to all meeting attendees. The Project Manager and the Authority's contract manager shall similarly receive all such drafts regardless of whether they attended the meeting.
TS-01 Requirement #4.4-4	Such draft meeting minutes shall include the action items list and reflect all item status changes that occurred during the meeting.
TS-01 Requirement #4.4-5	The Contractor shall revise and re-submit draft meeting minutes for as many iterations as necessary for the Authority to waive further revision.

4.4.1. Post Award Meeting

A post award meeting will be scheduled by the Authority. Before the meeting, the Authority will distribute a notice of the meeting along with an agenda of the subjects to be addressed.

At this meeting, the Authority will:

- Review the required milestone sequence detailed in section 4.2 above
- Discuss procedures for meetings, project correspondence, and points of contacts for administrative and technical communications
- Discuss procedures for Submittals (see section 4.6 below)
- Discuss procedures for processing change notices and change orders

- Discuss monthly progress reporting
- Discuss progress and final payments

Contract Criteria	
TS-01 Requirement #4.4.1-1	The Contractor's Project Manager, Quality Manager and Test Manager shall attend the post award meeting in person.
TS-01 Requirement #4.4.1-2	A representative from each of the Contractor's subcontractors shall attend the post award meeting in person.
TS-01 Requirement #4.4.1-3	At the post award meeting, the Contractor shall introduce the Contractor's Key Staff; provide and briefly describe an organization chart identifying managers of all departments, lead engineers, quality control staff and subcontractors; introduce the subcontractors' representatives and their scope of work; discuss the schedule and the sequencing of this entire Contract.

4.4.2. Progress Meetings

The Authority will distribute notices of progress meetings to the Contractor. The Authority will provide such notices at least:

- Fourteen (14) calendar days before each monthly progress meeting
- Five (5) calendar days before each weekly progress meeting

The Authority will prepare the agenda in coordination with the Contractor. The Authority will distribute the agenda for each progress meeting at least 48 hours prior to the meeting.

Contract Criteria	
TS-01 Requirement #4.4.2-1	The Contractor shall participate in one progress meeting each month during the period prior to successful completion of the Midpoint Design Review.
TS-01 Requirement #4.4.2-2	The Contractor shall participate in one progress meeting each week during the period after successful completion of the Midpoint Design Review and prior to Project Acceptance.
TS-01 Requirement #4.4.2-3	The Contractor shall forward all progress meeting information to all of their subcontractors including but not limited to: a) Notices of meetings b) Meeting agendas c) Meeting minutes and all action items pertaining to the subcontractor
TS-01 Requirement #4.4.2-4	One (1) working day prior to each progress meeting, the Contractor shall provide the Authority with updates to the baseline Progress Schedule that show all activities started, all activities completed to date, all ongoing activities and all activities scheduled for the next month.

Contract Criteria	
TS-01 Requirement #4.4.2-5	The Contractor shall have a representative of all subcontractors attend each progress meeting. The Authority will waive this requirement for the specific cases where a subcontractor did not perform work in the previous six (6) week period and the Progress Schedule (as defined in section 4.3.2 above) indicates that the same subcontractor will not perform work at the Authority's facilities within the subsequent six (6) week period.
TS-01 Requirement #4.4.2-6	At each progress meeting, the Contractor shall present the following: a) Introduction of new attendees and areas of responsibility b) Review of minutes of previous meetings, amendment of minutes if necessary, and acceptance of minutes c) Analysis of work accomplished since previous meeting, design issues, procurement, fabrication, product delivery, schedule changes, problems arising from proposed changes, and other circumstances which might affect progress of work d) Sequence of work and Progress Schedule wherein the Contractor shall report on all activities which are forecast to be completed beyond the approved schedule date(s) and shall identify means of maintaining the approved schedule e) Work quality observations, problems, and employee work standards as they pertain to successful completion of the Contract f) Changed conditions, time extensions, and other relevant subjects as they affect the progress of the work g) Corrective measures to maintain Progress Schedule when necessary h) Upcoming month's work
TS-01 Requirement #4.4.2-7	The Contractor shall develop and maintain an action item list which will indicate items to be resolved, person assigned to follow or resolve and anticipated date for resolution. Said action item list shall include a running list of action items that have been closed and any updates thereof shall be subject to Authority approval.
TS-01 Requirement #4.4.2-8	Inquiries, requests for information, and requests for solutions to problems presented during such meetings shall be answered, when possible, during the meeting. Answers provided orally at the meetings shall be recorded in the minutes. Those not answered during the meeting shall be resolved, documented, and delivered in writing or electronically to the Authority within fourteen (14) calendar days of the close of the meeting. Those problems that require more than fourteen (14) calendar days to resolve need to be clearly identified during the meeting and an alternative schedule agreed upon.

4.4.3. Working Meetings

Contract Criteria	
TS-01 Requirement #4.4.3-1	The Contractor shall schedule and conduct working meetings on strategic, tactical and operational issues no less frequently than on a weekly basis. At the sole discretion of the Authority, the frequency of meetings may be adjusted.
TS-01 Requirement #4.4.3-2	The purpose of working meeting shall include but is not limited to: a) Track the status of the work activities b) Review comments on submitted documentation c) Review the Contractor's performance to the contracted service level metrics d) Review Contractor's invoices for services provided e) Report or communicate on all availability of services and the environment directly impacting the Authority's services f) Resolve disputes
TS-01 Requirement #4.4.3-3	The Contractor shall produce and deliver to the Authority at least 48 hours prior to each working meeting: a) A meeting agenda identifying potential problems, issues and concerns to be resolved at the working meeting b) Documentation regarding or related to such problems, issues and concerns
TS-01 Requirement #4.4.3-4	The Contractor shall have a representative of each subcontractor participate in each working meeting. Such participation may be in-person, telephonically or waived altogether at the sole discretion of the Authority.
TS-01 Requirement #4.4.3-5	Working meetings shall include the participation of those Authority employees and consultants as the Authority may identify from time to time. Working meetings shall include the participation of the Authority's customer service center operator at the Authority's sole discretion.
TS-01 Requirement #4.4.3-6	Working meetings shall be held at a site selected by the Authority. Teleconferences may be substituted at the Authority's sole discretion. Working meetings requiring demonstration of equipment and major hardware shall be held at the Authority's facilities or at the Contractor's facilities or its subcontractor's facilities, as determined by the Authority.

4.5. Reports

4.5.1. Monthly Progress Reports

Contract Criteria	
TS-01 Requirement #4.5-1	The Contractor shall provide a written report of progress every month ("Monthly Progress Report").

Contract Criteria	
TS-01 Requirement #4.5-2	The Monthly Progress Report shall include but is not limited to: a) The Progress Schedule (see section 4.3.2 above), a forecast describing those activities that are likely to be completed beyond the approved schedule date(s) and a narrative of all means the Contractor is using to maintain the approved schedule. b) The Contractor's complete organization chart for this project and any proposed changes c) Work quality observations, problems, and employee work standards as they pertain to successful completion of the Contract d) Changed conditions, time extensions, and other relevant subjects as they affect the progress of the work e) The upcoming month's work
TS-01 Requirement #4.5-3	The Monthly Progress Report shall identify the current version of each Submittal document or drawing provided to the Authority.
TS-01 Requirement #4.5-4	The Monthly Progress Report shall identify all hardware that the Contractor has ordered per the Authority's authorization and the delivery status of each item.

4.5.2. Test Reports

Requirements for additional reports during Factory Acceptance Test, Revenue Service Acceptance Test and Project Acceptance Test are detailed in section 7 below.

4.6. Submittals

Proposal Criteria
The Offeror shall include in their proposal a summary of no more than one page-side, describing their document management system and internal review process for Contract deliverables.

Contract Criteria	
TS-01 Requirement #4.6-1	The Contractor shall coordinate the various disciplines on its team to develop all Toll System documents and drawings (hereafter a Submittal). Such documents and drawings include but are not limited to the: • Management Plan (section 4.3 above) • System Integration documents (section 5 below) • Infrastructure Documentation (section 11.3 below)
TS-01 Requirement #4.6-2	The Contractor shall place the Authority's contract name and contract number on all documents and drawings provided as part of a Submittal.

4.6.1. Submittal Document Management

Contract Criteria	
TS-01 Requirement #4.6.1-1	The Contractor shall maintain a secure on-line document management system containing all documentation submitted by the Contractor to the Authority.
TS-01 Requirement #4.6.1-2	The Contractor's administration of this secure on-line document management system shall provide for all persons identified by the Authority to efficiently access and download all documentation stored there via any Internet connection.
TS-01 Requirement #4.6.1-3	The Authority may from time to time provide the Contractor with an updated list of persons authorized to use the secure online document management system and the Contractor shall make the associated changes effective within two (2) business days of receiving each updated list.
TS-01 Requirement #4.6.1-4	The Contractor shall maintain the document management system so as to ensure that everyone is working from the same revision of any Submittal document or drawing at all times during the Contract.
TS-01 Requirement #4.6.1-5	The Contractor shall maintain the document management system such that the Contractor immediately notifies all parties, including the Authority, when a Submittal document or drawing has been changed and will clearly detail the new configuration numbering or lettering of the document to be used.
TS-01 Requirement #4.6.1-6	The Contractor shall sequentially number each revision of documents and drawings in a Submittal and all such numbering shall be recorded in the document management system.
TS-01 Requirement #4.6.1-7	The Contractor shall maintain the document management system such that the Contractor provides to the Authority as a monthly report showing the current version and date delivered for each Submittal document.
TS-01 Requirement #4.6.1-8	The Contractor shall maintain the document management system such that the Authority may immediately retrieve current and previous versions of all Submittal documents and drawings with minimal effort.
TS-01 Requirement #4.6.1-9	The Contractor shall provide additional copies of said Submittal documents and drawings to the Authority within seven (7) calendar days of any such request.

4.6.2. Submittal Review & Revision

The Authority will review and comment on each Submittal provided by the Contractor. The Authority requires a minimum of twenty-one (21) calendar days to review each document and drawing or re-vision of same made by the Contractor. The Contractor is encouraged to make partial deliveries of each Submittal much earlier than the twenty-one (21) day deadline described above to avoid creating a backlog in the Authority's review and comment process and corresponding delays.

Contract Criteria	
TS-01 Requirement #4.6.2-1	The Contractor shall develop and maintain during the life of the Contract, a comment and response tracking log to facilitate monitoring the progress of reviewing and revising all Submittal documents and drawings. The tracking log shall take the form of a spreadsheet or database and clearly delineate the comment and response process of all documents and drawings until successful completion of Project Acceptance.
TS-01 Requirement #4.6.2-2	The Contractor shall incorporate all Authority comments received on all Submittal documents and drawings.
TS-01 Requirement #4.6.2-3	The Contractor shall provide each such revised Submittal document or drawing as described above for as many iterations as necessary for the Authority to declare each Submittal document or drawing as "approved-in-principle" for the degree of completeness associated with the Submittal.

4.7. Quality Management

Proposal Criteria
The Offeror shall include in their proposal a summary of no more than one page-side, detailing their defect tracking, configuration management and software release management including products used and specifically addressing the quality assurance of the entire development, verification and release process.
The Offeror shall include in their proposal a summary of no more than two page-sides, describing how a similar quality plan was implemented as a quality program on one of their previous relevant projects and provide both a quantitative assessment of the results achieved through same and several specific relevant examples within the project.

The Contractor's quality program shall produce sufficient quality throughout all areas of performance in the Contract including, design, development, procurement, fabrication, processing, removal, construction, assembly, inspection, site preparation, installation, packaging, shipping, storage, testing, and maintenance to satisfy the Authority's requirements.

Contract Criteria	
TS-01 Requirement #4.7-1	The Contractor shall employ a quality program and it shall: a) Provide for the prevention and ready detection of discrepancies and for timely and positive corrective action b) Ensure that the Contractor's understanding of all Authority requirements is thorough and accurate and thoroughly documented and validated through all phases of the project such that the Toll System fully satisfies all Authority requirements c) Control all processes and functions within the Contractor d) Provide for effective control of all purchased materials and subcontracted work e) Include comprehensive inspection and verification for in-process, final assembly, unit tests and all other testing of the Toll System
TS-01 Requirement #4.7-2	The Contractor shall immediately establish and conduct the quality program described by the quality section(s) of the Management Plan (see section 4.3.3 above).
TS-01 Requirement #4.7-3	All work under this Contract shall be controlled completely by the Contractor according to the quality section(s) of the Management Plan (see section 4.3.3 above). Such work includes but is not limited to procurement, manufacturing, fabrication, assembly, development, integration, test, installation and maintenance.
TS-01 Requirement #4.7-4	The Contractor shall control all supplies and services, whether manufactured or performed within the Contractor's plant or at any other source, at all points necessary to ensure conformance to the technical specifications of the Contract.
TS-01 Requirement #4.7-5	The Contractor shall make objective evidence of quality conformance readily available to the Authority upon request.

4.8. Security

The Authority will issue identification credentials to Contractor employees and subcontractor personnel working at Authority facilities. Said credentials will be issued at no charge.

Contract Criteria	
TS-01 Requirement #4.8-1	The Contractor shall ensure that all security requirements specified elsewhere in the Contract are adhered to by all people on the Contractor's team.
TS-01 Requirement #4.8-2	The Contractor shall immediately establish and conduct the security program described in the Management Plan (see section 4.3.4 above).

Contract Criteria	
TS-01 Requirement #4.8-3	All work under this Contract shall be controlled completely by the Contractor according to the security program described in the Management Plan (see section 4.3.4 above). Such work includes but is not limited to manufacturing, fabrication, assembly, development, integration, testing, installation and maintenance.
TS-01 Requirement #4.8-4	The Contractor shall conduct comprehensive background checks on all employees and subcontractor personnel working on the Contract.
TS-01 Requirement #4.8-5	Authority-issued identification credentials shall be worn by the respective individual in an appropriate, visible location at all times while at Authority facilities.
TS-01 Requirement #4.8-6	The Contractor shall secure and safeguard all of its tools at the Authority's facilities at all times.
TS-01 Requirement #4.8-7	The Contractor shall secure and safeguard all Toll System equipment and materials at the Authority's facilities until they are completely installed in full accordance with the Design Drawings and Design Specifications.
TS-01 Requirement #4.8-8	The Contractor shall provide and manage the security required under this Contract.
TS-01 Requirement #4.8-9	The Contractor shall ensure that all confidentiality requirements specified elsewhere in the Contract are adhered to by all people on the Contractor's team.
TS-01 Requirement #4.8-10	The Project Manager shall notify the Authority of all security incidents, concerns and issues within two (2) hours of their occurrence.
TS-01 Requirement #4.8-11	The Project Manager shall provide a draft report to the Authority analyzing all security incidents, concerns and issues within two (2) calendar days of their occurrence. The Project Manager shall update said report every week until the underlying issue is corrected and the Authority waives further updates.
TS-01 Requirement #4.8-12	The Contractor shall perform all security related tasks as described in the Management Plan (see sections 4.3 and 4.3.4 above).
TS-01 Requirement #4.8-13	The Contractor shall conduct comprehensive security audits on both a scheduled and ad hoc basis as detailed in the Security section of the Management Plan.

As detailed in the TS-02 document, the Contractor shall complete an audit of the Statement on Standards for Attestation Engagements (SSAE) No. 16 and the International Standards for Assurance Engagements (ISAE) No. 3402 annually.

As detailed in the Contract, the Authority reserves the right to:

- Have any Contractor employee or subcontractor personnel removed from working on the Contract at any time and for any reason

- Conduct additional background checks on any Contractor employee and subcontractor personnel at any time at the Authority's own expense

- Conduct additional security audits at any time at the Authority's own expense.

4.9. Configuration & Change Management

The Authority is aware that versions of Commercial Off The Shelf (COTS) equipment and software might change after Notice To Proceed.

The requirements for the Contractor to document its processes for managing such changes are described in section 4.3.5 above and Contractor's obligations for furnishing and installing such changes are detailed in the TS-02 document.

Contract Criteria	
TS-01 Requirement #4.9-1	The Contractor shall immediately establish and conduct the configuration and change management program described in the Management Plan (see Section 4.3.5 above).
TS-01 Requirement #4.9-2	All Work under this Contract shall be controlled completely by the Contractor according to the configuration and change management program described in the Management Plan (see section 4.3.5 above). Such work includes but is not limited to manufacturing, fabrication, assembly, development, integration, testing, installation and maintenance.

4.10.   Permits and Licenses

The Authority will obtain all FCC licenses for the E-ZPass AVI function described in the TS-05 and TS-06 document.

The Contractor shall obtain all other necessary permits and licenses, and pay all associated fees, as described elsewhere in the Contract.

4.11.   Record Keeping

Contract Criteria	
TS-01 Requirement #4.11-1	The Contractor shall retain all proof of purchase and payment in the form of dated invoice, shipping bills and payment receipts and furnish un-redacted copies of same to the Authority upon request.

Contract Criteria	
TS-01 Requirement #4.11-2	The Project Manager shall report any of the items listed above that are missing prior to requesting the associated payment from the Authority.

5. SYSTEM INTEGRATION

Proposal Criteria
The Offeror shall include in their proposal a summary of no more than three (3) page-sides, describing their approach to system integration and how this approach will address the requirements below. This description shall include all document approval and control procedures and shall address the review cycles and impact on schedule.
The Offeror shall include in their proposal a summary of no more than three (3) page-sides, describing their approach to documenting system design and integration. This summary shall address all Contractor document approval and control procedures as well as Submittals to the Authority and associated review cycles.

5.1. General Requirements

5.1.1. Software

Contract Criteria	
TS-01 Requirement #5.1.1-1	All operating systems, databases, other middleware and other Toll System COTS software furnished by the Contractor shall be field proven.
TS-01 Requirement #5.1.1-2	All operating systems, databases, other middleware and other Toll System software furnished by the Contractor shall be supported with patches and fixes from their respective manufacturer for at least ten (10) years after successful completion of Project Acceptance Test.
TS-01 Requirement #5.1.1-3	All Toll System software shall be parameter driven and configurable and provide flexibility for the Authority to readily change said parameters and configurations.
TS-01 Requirement #5.1.1-4	All Toll System software that has a user interface shall provide a browser based Graphical User Interface (GUI) for all user interface functions and this GUI shall consistently follow accepted human engineering design standards for ease of readability, understandability, appropriate use of menu-driven operations, appropriate use of context-sensitive help, user customization and intuitive operation.
TS-01 Requirement #5.1.1-5	The Toll System shall include all tools and other debug features necessary for the Authority to troubleshoot all software problems that may arise in the Toll System.

5.1.2. System Security

Contract Criteria	
TS-01 Requirement #5.1.2-1	The Contractor shall fully define user access security in the System Detailed Design document (see section 5.3 below) and such user access security shall be subject to the Authority's approval.
TS-01 Requirement #5.1.2-2	The Toll System shall limit access to all information on the Toll System to authorized Authority personnel and Contractor personnel only and all such access shall be controlled by multi-factor authentication.
TS-01 Requirement #5.1.2-3	The Toll System shall provide user role based security, where all users in the same category have the same system privileges.
TS-01 Requirement #5.1.2-4	The Toll System shall provide user access security including sign-on facilities, permission control and different levels of access for all files, directories and application software.
TS-01 Requirement #5.1.2-5	The Toll System shall provide tools and all other functions necessary for the system administrator to view and update access levels via a graphical and easy to read table.
TS-01 Requirement #5.1.2-6	The Toll System shall provide for additions, changes to the access levels and removals of personnel in a secure manner and comprehensively log all such actions.
TS-01 Requirement #5.1.2-7	The Toll System shall comply with the Commonwealth of Virginia security requirements that are available at: http://www.vita.virginia.gov/library/default.aspx?id=537#securityPSGs
TS-01 Requirement #5.1.2-8	The Contractor shall not circumvent any Toll System security approved by the Authority.

Additional system security requirements, if any, are described in the Tolling Specification for each subsystem.

5.1.3. Network Security

Contract Criteria	
TS-01 Requirement #5.1.3-1	The Contractor shall implement the Toll System using commercially reasonable best practices for securing all interfaces and communications between Toll System elements including but not limited to multi-factor authentication, virtual private networks, strong passwords, encryption and intrusion detection.
TS-01 Requirement #5.1.3-2	The Toll System shall comprehensively log all successful log-ins and all unsuccessful log-in attempts.

Contract Criteria	
TS-01 Requirement #5.1.3-3	The Toll System shall cause its MOMS function to issue an alert whenever the number of consecutive unsuccessful log-in attempts for a single user exceeds a threshold and such threshold shall be configurable by a Authority user(s).
TS-01 Requirement #5.1.3-4	The Toll System shall comply with commercially reasonable best practices for accessing the Toll System from remote locations including but not limited to multi-factor authentication, virtual private networks and strong encryption of any other communications.

Additional security requirements, if any, are described in the Tolling Specification for each subsystem.

5.1.4. Hardware

Hardware requirements are detailed in the TS-03 document and in the Tolling Specification document (TS-04, TS-05 and TS-06) of the respective Toll System element.

5.1.5. Reliability (MTBF)

Proposal Criteria
As part of their proposal, the Offeror shall provide the manufacturer's specification of Mean Time Between Failure (MTBF) for all individual field replaceable units or higher level assemblies as part of their Bill Of Materials.

5.1.6. Availability

Contract Criteria	
TS-01 Requirement #5.1.6-1	Each element of the Toll System shall operate as specified and without degradation or failure for a minimum percentage of each specified period. This percentage is defined as Availability.
TS-01 Requirement #5.1.6-2	Availability shall be assessed using the following calculation: $$Availability = 100\% - \left(\frac{\#\ Hours\ Downtime + \#\ Hours\ Degraded\ Operation}{\#\ Hours\ In\ Time\ Period}\right)$$

Contract Criteria	
TS-01 Requirement #5.1.6-3	For purposes of calculating the Availability of a Toll System element, non-chargeable failures shall only consist of: • The response and repair time allowed (per the TS-02 document) for clearing debris from, and making related repairs to, an automatic coin machine • Vandalism other than ACM debris • Failure of a test facility or test instrumentation • System component failures caused by externally applied stress conditions outside of the specified requirements • Scheduled preventive maintenance activities that have a specific work scope, duration and frequency clearly specified in the Maintenance Plan • Failures that are patron or user induced

TS-01 Requirement #5.1.6-4	For purposes of calculating the Availability of the Toll System, chargeable failures shall include any and all other failures including, but not limited to:
	• A malfunction which prevents the Toll System (hardware or software) from performing its designated function, when used and operated under its intended operational and environmental conditions as detailed in this document
	• A malfunction that poses a threat to the safety of the Toll System components or the Authority's customers, employees or others
	• A failure of equipment or software that causes or allows:
	   o Revenue loss to occur
	   o Incorrect processing, storage, transmission or reporting of required transaction data
	   o Incorrect financial reconciliation of the Toll System or prevents such reconciliation from being performed
	• Software anomalies and bugs that affect the performance and operation of the Toll System
	• Shutdown or unavailability of a Toll System function unless specifically directed by the Authority

The Availability requirement for each Toll System element is specified in the Tolling Specification document (TS-04, TS-05 and TS-06) of the respective element.

5.1.7. Data Migration

Contract Criteria	
TS-01 Requirement #5.1.7-1	The Contractor shall migrate three (3) years of summary traffic and revenue data from existing host A (serving the Powhite Parkway ORT zones) to the Host Subsystem such that the Host Subsystem uses this summary data to provide comparisons of transactions generated by the Toll System with traffic and revenue over said period.

Contract Criteria	
TS-01 Requirement #5.1.7-2	The Contractor shall migrate three (3) years of summary traffic and revenue data from existing host B (serving the traditional lanes and DTE ORT zone) to the Host Subsystem such that the Host Subsystem uses this summary data to provide comparisons of transactions generated by the Toll System with traffic and revenue over said period.

The Contractor shall perform all data migration tasks as described in the data migration section of the Management Plan.

5.2. System Design Requirements (SDR) Document

The Contractor shall develop and furnish a System Detailed Requirements (SDR) document as follows.

Contract Criteria	
TS-01 Requirement #5.2-1	The Contractor shall conduct a series of workshops, reviews and focus meetings to gather all technical requirements for the Toll System including but not limited to Authority Business Rules and other operational requirements.
TS-01 Requirement #5.2-2	The Contractor shall develop and furnish a SDR document that: a) Identifies all Toll System requirements stated in the Tolling Specification documents (TS-01 through TS-06) and all derivative requirements b) Identifies and documents all System requirements gathered through the workshops, reviews and focus meetings described above including but not limited to those Toll System requirements related to authority business rules and operational requirements
TS-01 Requirement #5.2-3	The SDR document shall include a requirements traceability matrix showing each Contract requirement, where that requirement is addressed by the design described by the System Detailed Design document (see section 5.3 below) and which part(s) of the Contractor's testing plan (see section 4.3.8 above) is intended to validate such design.
TS-01 Requirement #5.2-4	The Contractor shall furnish the SDR document to the Authority in electronic form consisting of source files in .DOCX (compatible with Microsoft Word 2010), .XLSX (compatible with Microsoft Excel 2010), or .PPTX (compatible with Microsoft Powerpoint 2010).
TS-01 Requirement #5.2-5	The Contractor shall furnish the SDR document to the Authority in electronic form consisting of each source file above after conversion to .PDF format for printing on 8.5" by 11" paper.
TS-01 Requirement #5.2-6	The SDR document shall detail the Contractor's understanding of the Authority's requirements and shall clearly identify those areas in which these understandings may deviate from the requirements stated in the TS-02, TS-04, TS-05 and TS-06 documents.

Contract Criteria	
TS-01 Requirement #5.2-7	Upon approval in principle by the Authority, the Contractor shall use the SDR document as the basis for design.

5.3. System Detailed Design (SDD) Document

The Contractor shall develop and furnish a System Detailed Design (SDD) document as follows.

Contract Criteria	
TS-01 Requirement #5.3-1	The Contractor shall furnish the SDD document in electronic form consisting of source files in .DOCX (compatible with Microsoft Word 2010), .XLSX (compatible with Microsoft Excel 2010), or .PPTX (compatible with Microsoft Powerpoint 2010).
TS-01 Requirement #5.3-2	The Contractor shall furnish the SDD document in electronic form consisting of each source file above after conversion to .PDF format for printing on 8.5" by 11" paper.
TS-01 Requirement #5.3-3	The SDD document shall detail the implementation of the requirements identified in the System Design Requirement document (see section 5.2 above) above and the Tolling Specification document (e.g. TS-04, TS-05 and TS-06) of the respective Toll System element.
TS-01 Requirement #5.3-4	The SDD document shall contain an executive summary section that describes the Toll System's major components and features of the Toll System which address performance; security; ease of use; reliability; availability and serviceability.
TS-01 Requirement #5.3-5	The SDD document shall contain a design overview that describes the overall design. This overview shall additionally describe the advantages and disadvantages of the Toll System design (e.g., modularity, flexibility, expandability) and provide an explanation of why the design is the best implementation to meet the Authority's requirements.
TS-01 Requirement #5.3-6	The SDD document shall contain a systems architecture section.
TS-01 Requirement #5.3-7	The system architecture section of the SDD document shall contain a system-level graphic representation of hardware components; describe their interconnections; and identify both the interfaces between each Toll System element and the interfaces to any external systems.
TS-01 Requirement #5.3-8	The system architecture section of the SDD document shall contain a data flow diagram that depicts the logical processes that comprise the Toll System and an illustration that depicts the data flow as the data moves between these processes. This section shall identify all of the Toll System's functional processes and show the flow from the data's inception to its long-term storage.

Contract Criteria	
TS-01 Requirement #5.3-9	The system architecture section of the SDD document shall contain a data loading analysis that identifies the type, the amount, and the frequency of data transmission which originated from physical devices and logical processes, and traces the data flow through all communications paths from the origin of the data to its destination, including all intermediate processes or equipment. The section shall contain an analysis of the bandwidth required to support the aggregated data that is likely to traverse each of the communications paths in the Toll System.
TS-01 Requirement #5.3-10	The SDD document shall contain system processing narratives detailing each major processing activity performed by the Toll System. Each narrative shall describe how all people, equipment and software interact to satisfy the functional requirements of the Toll System and provide a clear and comprehensive explanation of how each of the Authority's functional requirements is supported by the Toll System.
TS-01 Requirement #5.3-11	The SDD document shall contain a security section.
TS-01 Requirement #5.3-12	The security section of the SDD document shall detail all security features, computer controlled and physical, designed into the Toll System to control and monitor access to the Toll System and its components (e.g., hardware, software and data).
TS-01 Requirement #5.3-13	The security section of the SDD document shall describe all features, components and equipment which protect the Toll System components from physical hazards such as temperature, humidity, tampering, electrical power surges, brown-outs, and black-outs.
TS-01 Requirement #5.3-14	The SDD document shall include an updated requirements traceability matrix showing each Contract requirement, identifying where that requirement is addressed by the SDD document and detailing the test activity in the Contractor's testing plan (see section 4.3.8 above) that should prove the requirement is satisfactorily addressed.

5.3.1. System Software

Contract Criteria	
TS-01 Requirement #5.3.1-1	The SDD document shall contain a software section(s).
TS-01 Requirement #5.3.1-2	The software section(s) of the SDD document shall demonstrate compliance with all data requirements specified in the SDR document.

Contract Criteria	
TS-01 Requirement #5.3.1-3	The software section(s) of the SDD document shall describe the software architecture and contain system-level illustrations, such as flowcharts and block diagrams, illustrating the overall structure of the Toll System software. These diagrams shall include the major processing functions performed by each subsystem or major module, their interaction with each other and with various Toll System users.
TS-01 Requirement #5.3.1-4	The software section(s) of the SDD document shall describe the major program modules. This section shall include block diagrams, flow charts, and/or other software design documentation that describe the design of the Toll System software by major subsystem. This information shall include the details of main processing functions performed by each program or module, including inputs and outputs.
TS-01 Requirement #5.3.1-5	The software section(s) of the SDD document shall describe the software configuration, including the configuration of the operating system, application, database/data management, utility, graphical user interface, device drivers and any other software used in the Toll System.
TS-01 Requirement #5.3.1-6	The software section(s) of the SDD document shall identify which software is to be custom developed and which is Commercial Off The Shelf (COTS) software.
TS-01 Requirement #5.3.1-7	The software section(s) of the SDD document shall explain the functions to be performed by COTS software and identify the manufacturer, version, and release to be used.
TS-01 Requirement #5.3.1-8	For all COTS software, the software section(s) of the SDD document shall contain all technical specifications and literature produced or customarily provided by the software manufacturer including but not limited to: a) User documentation b) System administrator documentation c) Reference manuals d) Copies of software development licenses The documentation shall include sufficient information to enable the Authority to fully operate and perform System administration duties for the COTS software product for each type of computer processor furnished as part of the Contract.
TS-01 Requirement #5.3.1-9	The software section(s) of the SDD document shall identify the languages, compilers, and utilities to be used (including version and release number) in development, compiling and operation of custom developed software.
TS-01 Requirement #5.3.1-10	The software section(s) of the SDD document shall identify the languages, compilers, and utilities to be used (including version and release number) in compiling, configuring and operation of COTS software.
TS-01 Requirement #5.3.1-11	The software section(s) of the SDD document shall describe the database; data management structure and overall organization of all files and/or databases used by the Toll System.

Contract Criteria	
TS-01 Requirement #5.3.1-12	The software section(s) of the SDD document shall fully describe all COTS database products used by the Toll System including version, release, functional characteristics, operational requirements, and any other relevant characteristics of the product.
TS-01 Requirement #5.3.1-13	The software section(s) of the SDD document shall identify all data elements.
TS-01 Requirement #5.3.1-14	The software section(s) of the SDD document shall provide a description of all data input to the Toll System and all data output by the Toll System.
TS-01 Requirement #5.3.1-15	The software section(s) of the SDD document shall provide a data dictionary listing all System data elements and describing the size, definition, validation rules and other information pertaining to each. If a COTS data dictionary is to be used, the software section(s) of the SDD document shall identify the manufacturer, version, and release.
TS-01 Requirement #5.3.1-16	Such data dictionary shall be sufficient for a programmer with average skills or better to understand the database structure, all data elements and all relationships between data elements.
TS-01 Requirement #5.3.1-17	The software section(s) of the SDD document shall provide an entity-relationship diagram illustrating the interactions between the various entities for which data is collected in the Toll System that depicts the relationships between the entities and their associated data. This description shall identify all significant Toll System entities (person, object, place, events, etc.) and show the nature of all significant interactions from the data's inception to storage.
TS-01 Requirement #5.3.1-18	The software section(s) of the SDD document shall describe the overall organization of the files and tables to be used in the Toll System. This description shall include an identification of all data files, tables, and fields; fully describe the relationships between fields and tables; and demonstrate compliance with the data requirements specified herein.
TS-01 Requirement #5.3.1-19	The software section(s) of the SDD document shall contain a data storage analysis and describe the techniques employed to ensure that the Toll System can meet the storage requirements for on-line and historical data, and expansion capabilities. The analysis shall include identification of all files (e.g., system, message, report files), databases, and their retention cycles. The analysis shall include a description of whether the information will be available for on-line retrieval or archived in off-line storage.
TS-01 Requirement #5.3.1-20	The software section(s) of the SDD document shall provide an Interface Control Document detailing all interfaces between the Host Subsystem and the ORT Zone Subsystem including but not limited to data and control for modes of operation, transponder status, toll rates, authority users, ID cards, transactions, image files, MOMS and DVAS.

Contract Criteria	
TS-01 Requirement #5.3.1-21	The software section(s) of the SDD document shall provide an Interface Control Document detailing all interfaces between the Host Subsystem and the Traditional Lane Subsystem including but not limited to data and control for modes of operation, transponder status, toll rates, authority users, ID cards, transactions, image files, MOMS and DVAS.
TS-01 Requirement #5.3.1-22	The software section(s) of the SDD document shall detail all Toll System data and control supporting the interface(s) between the Toll System and the VDOT E-ZPass Customer Service Center.
TS-01 Requirement #5.3.1-23	The software section(s) of the SDD document shall detail all Toll System data and control supporting the interface(s) between the Toll System and workstations on the Authority's wide area network.
TS-01 Requirement #5.3.1-24	The software section(s) of the SDD document shall fully describe all communications protocols such that a third party systems integrator could write a software driver to fully implement the Interface Control Documents described above and fully access all features of the Toll System required by the Tolling Specification (TS-xx) documents. This section shall include, but not be limited to the following: a) List of all supported objects and what functions they invoke b) A traceability matrix that identifies the objects used to support the specific functional requirements of the contract
TS-01 Requirement #5.3.1-25	The software section(s) of the SDD document shall describe all Toll System human interfaces including user tools and techniques employed to ensure an easy to use, consistent, and efficient interface between the operator and the Toll System. Examples of such techniques include: a) The use of a graphical user interface b) Standardization in the formatting of screens and reports c) Consistent use of program function keys d) Color coded alarm notification e) Drop down and pop-up menus

5.3.2. System Hardware

Contract Criteria	
TS-01 Requirement #5.3.2-1	The SDD document shall contain a hardware section(s).

Contract Criteria	
TS-01 Requirement #5.3.2-2	The hardware section(s) of the SDD document shall contain drawings that clearly and completely indicate the function of each System hardware component. The drawings shall indicate termination points of devices, and interconnections required for System operation, interconnection between modules and devices, spacing of components, and location, mounting and positioning details. These component drawings are not a substitute for the Detailed Design Drawings required elsewhere in the Tolling Specification (TS-xx) documents.
TS-01 Requirement #5.3.2-3	The hardware section(s) of the SDD document shall contain a system-level diagram of the communications network and specifications for each major component and identify how the component functions in the network. Network diagrams shall include System communications diagrams detailing the wiring and interconnections between the Toll System and other devices.
TS-01 Requirement #5.3.2-4	The hardware section(s) of the SDD document shall contain detailed diagrams and full technical specifications of communications network components, hardware and software, and communications protocols and network topologies used in the Toll System architecture. These detailed diagrams are not to substitute the required Detail Contract Drawings elsewhere in the Tolling Specification (TS-xx) documents.
TS-01 Requirement #5.3.2-5	The hardware section(s) of the SDD document shall describe the techniques employed to ensure that the network can meet the volume of transaction traffic to be supported and is capable of meeting performance and expansion requirements
TS-01 Requirement #5.3.2-6	The hardware section(s) of the SDD document shall describe the quality, function, and capability of each piece of Toll System equipment. Where applicable, this section shall also depict rack and/or enclosure equipment layouts, including dimensions of rack and components.
TS-01 Requirement #5.3.2-7	The hardware section(s) of the SDD document shall provide descriptive material (i.e. catalog cut sheets, software interface documents, installation manuals, maintenance manuals, drawings, brochures, etc.) for each proposed type of Toll System equipment that: a) Clearly demonstrates the equipment will meet the functional objectives of the Toll System b) Provides sufficient technical data for complete evaluation of the equipment and Toll System by the Authority
TS-01 Requirement #5.3.2-8	The hardware section(s) of the SDD document shall contain complete specifications (e.g., make, model, part number, version number, optional feature set installed, expansion slots, communications ports, etc.) for each Toll System equipment item.

Contract Criteria	
TS-01 Requirement #5.3.2-9	The hardware section(s) of the SDD document shall contain: a) Sufficient information for the Authority to fully operate and maintain each Toll System equipment item including schematic wiring, interconnection diagrams, and complete instructions for proper installation including equipment outlines, mounting, a complete parts list, and a list of recommended spares b) Text that describes all functional capabilities of each Toll System equipment item, and explains all adjustments including how they are performed and their effect on equipment operation c) Flow charts that describe troubleshooting procedures in a logical manner d) Descriptions of required test equipment e) Instructions for using the test equipment to maintain and repair Toll System equipment items f) Information necessary for the proper installation, start-up, initialization, and operation of the Toll System equipment item g) Environmental and operational specifications of each Toll System equipment item including but not limited to operating temperature range and other operating environment limitations, power requirements, electromagnetic energy limitations, equipment weight, special handling considerations, equipment power dissipation rates, and cooling requirements

5.3.3. Design Analysis

Contract Criteria	
TS-01 Requirement #5.3.3-1	The SDD document shall contain a design analysis section.
TS-01 Requirement #5.3.3-2	The design analysis section of the SDD document shall contain a requirements matrix identifying a) Each design requirement and approved design change b) The logical processes and physical system/subsystem components of the Toll System where such requirement will be implemented
TS-01 Requirement #5.3.3-3	This requirements matrix shall further: a) State the specific section of the System Detailed Design document that details the Toll System design addressing each such requirement b) Identify the testing phase where (e.g. Factory Acceptance Test) the implementation of each such requirement will be tested to prove that Toll System satisfies the requirement
TS-01 Requirement #5.3.3-4	The SDD document shall contain a system reliability section.

Contract Criteria	
TS-01 Requirement #5.3.3-5	The system reliability section of the SDD document shall contain a description and calculation of Toll System reliability based on the MTBF and expected MTTR for each major component and subsystem.
TS-01 Requirement #5.3.3-6	The SDD document shall contain a system availability section.
TS-01 Requirement #5.3.3-7	The system availability section of the SDD document shall describe failure handling and recovery using a failure / switchover / recovery matrix showing the types of failures, the process of reporting these failures and how switchover to the backup and redundant components is done.
TS-01 Requirement #5.3.3-8	The system availability section of the SDD document shall contain descriptions of all System diagnostics to detect and isolate failures.
TS-01 Requirement #5.3.3-9	If the configuration requires redundant or high availability components or equipment, the system availability section of the SDD document shall provide a description of the hardware and/or software features incorporated to meet the requirement for high availability in the event of the failure of one or more System components.
TS-01 Requirement #5.3.3-10	The SDD document shall contain a performance section.
TS-01 Requirement #5.3.3-11	The performance section of the SDD document shall detail the capability of the Toll System to meet the performance requirements in the Authority's toll environment.
TS-01 Requirement #5.3.3-12	The performance section of the SDD document shall describe, explain, and document the analysis that was used to support the Contractor's statements of performance, durability, and availability. Where such statements rely upon third party claims, promises, or warranties, this section shall include copies, or, as appropriate, original documentation of said promises, representations, and warranties.
TS-01 Requirement #5.3.3-13	The performance section of the SDD document shall provide complete product information for any automated tools used in this analysis.

5.3.4. Other

Contract Criteria	
TS-01 Requirement #5.3.4-1	The SDD document shall include but not be limited to descriptions of the following: a) Toll System architecture, including overall system design concept b) Toll System logic diagrams c) All user interfaces (including reports and screen formats) d) All interfaces between the Toll System and other systems e) Detailed data management design and processes, including summarization, archiving and purging
TS-01 Requirement #5.3.4-2	The SDD document shall detail: a) All equipment by location b) All peripheral device interfaces and control c) Server design, including sizing and processing calculations d) Storage system design, including sizing and processing calculations e) Network sizing and design details including Internet Protocol scheme and space requirements f) Data backup systems design, including sizing and processing calculations
TS-01 Requirement #5.3.4-3	The SDD document shall detail: a) All peripheral device interfaces and control b) Signal and communications cabling diagrams c) Rack and all other enclosure layouts d) Power requirements e) Power cabling diagrams f) UPS sizing information detailing all equipment on the UPS(s) and their total power requirements
TS-01 Requirement #5.3.4-4	The SDD document shall detail: a) All fault tolerant aspects of the Toll System design including servers, storage, network, database and application b) Degraded mode of operations and their related impact on system operations c) All disaster recovery aspects of the Toll System design including servers, storage, network, database, data resiliency and application

Contract Criteria	
TS-01 Requirement #5.3.4-5	The SDD document shall: a) Provide all COTS operating system and COTS middleware configurations and integration details b) Describe all custom developed software c) Provide a detailed list of all other COTS software d) Contain data flow diagrams, state diagrams and data queues e) Detail all interfaces, including MOMS function and Digital Video Audit function, between the Host Subsystem, ORT Zone Subsystem and Traditional Lane Subsystem in a comprehensive Interface Control Document form f) Provide comprehensive data dictionaries for all databases and all other data storage constructs g) Contain detailed database design, schema and entity relationship modeling, including sizing and processing calculations
TS-01 Requirement #5.3.4-6	The SDD document shall detail: a) Lane logic and vehicle framing design and rules with illustrations b) Transaction processing design, including sizing and processing calculations c) Transaction audit design
TS-01 Requirement #5.3.4-7	The SDD document shall detail: a) All MOMs monitoring design b) All Toll System access control and other security measures
TS-01 Requirement #5.3.4-8	The SDD document shall detail all Toll System automated processes and data the Contractor will use to satisfy the Operations And Maintenance Services requirements in the TS-02 document.

5.4. Detailed Test Procedures

The Contractor shall develop and furnish a Detailed Test Procedures document as follows.

Contract Criteria	
TS-01 Requirement #5.4-1	The Contractor shall furnish the Detailed Test Procedures in electronic form consisting of source files in .DOCX (compatible with Microsoft Word 2010), .XLSX (compatible with Microsoft Excel 2010), or .PPTX (compatible with Microsoft Powerpoint 2010).
TS-01 Requirement #5.4-2	The Contractor shall furnish the Detailed Test Procedures in electronic form consisting of each source file above after conversion to .PDF format for printing on 8.5" by 11" paper.
TS-01 Requirement #5.4-3	The Detailed Test Procedures document shall describe all test related activities including but not limited to those activities required to prepare for, conduct, measure and assess all of the testing required by section 7 below.

Contract Criteria	
TS-01 Requirement #5.4-4	The Detailed Test Procedures document shall include an updated requirements traceability matrix showing each Contract requirement, identifying where that requirement is addressed by the SDD document and identifying which test procedure(s) should prove that the requirement is satisfactorily addressed.
TS-01 Requirement #5.4-5	The Detailed Test Procedures document shall detail all procedures for Factory Acceptance Test, where all such testing occurs at a Contractor facility.
TS-01 Requirement #5.4-6	These Factory Acceptance Test procedures shall demonstrate all Toll System functions required by the Tolling Specification document (TS-04, TS-05 or TS-06) of the respective Toll System element.
TS-01 Requirement #5.4-7	These Factory Acceptance Test procedures shall detail all ORT zones and traditional lanes, vehicles by type and the quantity of each, transponders by type and the quantity of each and license plates by issuing state and type that will be used in each test case; and the associated data collection methodology.
TS-01 Requirement #5.4-8	While they may not statistically prove Toll System performance with a high confidence level; these Factory Acceptance Test procedures shall provide a reasonable indication that the Toll System is capable of meeting all stated performance requirements.
TS-01 Requirement #5.4-9	The Detailed Test Procedures document shall detail all procedures for Revenue Service Acceptance Test, where all such testing occurs at the Authority's facilities.
TS-01 Requirement #5.4-10	These Revenue Service Acceptance Test procedures shall demonstrate all Toll System functions required by the Tolling Specification document (TS-04, TS-05 or TS-06) of the respective Toll System element.
TS-01 Requirement #5.4-11	These Revenue Service Acceptance Test procedures shall detail all ORT zones and traditional lanes, vehicles by type and the quantity of each, transponders by type and the quantity of each and license plates by issuing state and type that will be used in each test case; and the associated data collection methodology.
TS-01 Requirement #5.4-12	These Revenue Service Acceptance Test procedures shall prove all Host Subsystem, ORT Zone Subsystem and Traditional Lane Subsystem function.
TS-01 Requirement #5.4-13	These Revenue Service Acceptance Test procedures shall: - Be sufficient to provide all Key Performance Indicators (KPIs, as detailed in the TS-02 document) of the Toll System with a statistical confidence level of 80% or better - Specify the pass/fail criteria - Specify the number of allowable failures for achieving this confidence level
TS-01 Requirement #5.4-14	The Detailed Test Procedures document shall detail all procedures for Project Acceptance Test, where all such testing occurs at the Authority's facilities.

Contract Criteria	
TS-01 Requirement #5.4-15	These Project Acceptance Test procedures shall: - Be sufficient to provide all KPIs of the Toll System with a statistical confidence level of 80% or better - Specify the pass/fail criteria - Specify the number of allowable failures for achieving this confidence level

5.5. System Manuals

Contract Criteria	
TS-01 Requirement #5.5-1	The Contractor shall develop and furnish System Manuals as follows.
TS-01 Requirement #5.5-2	The Contractor shall furnish System Manuals in electronic form consisting of source files in .DOCX (compatible with Microsoft Word 2010), .XLSX (compatible with Microsoft Excel 2010), or .PPTX (compatible with Microsoft Powerpoint 2010).
TS-01 Requirement #5.5-3	The Contractor shall furnish System Manuals in electronic form consisting of each source file above after conversion to .PDF format for printing on 8.5" by 11" paper.

5.5.1. System Administrator Manual

Contract Criteria	
TS-01 Requirement #5.5.1-1	The Contractor shall develop, furnish and update a System Administrator Manual as part of the System Manuals.
TS-01 Requirement #5.5.1-2	The System Administrator Manual shall contain graphical depictions and detailed written descriptions of all functions and procedures required for the proper monitoring and administration of the Toll System.

Contract Criteria	
TS-01 Requirement #5.5.1-3	This manual shall address all aspects of Toll System administration including but not limited to the following: a) Backup and recovery features and procedures b) Performance analysis c) Scheduled maintenance d) Patch management procedures e) Audit and control procedures f) Contingency plans g) Configuration control/change management h) System diagnostics i) Database/data integrity safeguards and procedures j) Inventory listings of equipment and software k) Special requests l) A list of all expendable supplies and sources
TS-01 Requirement #5.5.1-4	This manual shall contain a section(s) describing the administration of all software applications and all configuration functions including, but not limited to, the following items: a) Detailed instructions and procedures for the installation and configuration of the software b) Detailed description and procedures for configuration of user access privileges and access levels to use of all application functions c) Detailed description and procedures for the configuration and management of the application and its databases d) Detailed description and procedures for installing, backing up and restoring the application software e) Detailed procedures for System generation f) Detailed description and procedures for event logs maintenance activities including downloading, sorting, printing and clearing g) Detailed description and procedures for conducting System health checks to ensure the operational health and vitality of the Toll System

Contract Criteria	
TS-01 Requirement #5.5.1-5	A separate, removable section of the System Administration Manual shall contain information on the proper administration and control of the security features built into the Toll System. This removable section shall include, but is not limited to, details on: a) Procedures for granting, modifying and deleting access to the Host Subsystem and its functions including screens and reports, including but not limited to those for the traffic and revenue related functions, VAS functions and MOMS functions b) User identifiers c) Multi-factor authentication control, including but not limited to password issuance and resets d) Security policies e) Definition of staff roles and responsibilities f) Description of the types of Toll System user accounts provided and the functions of the Toll System to which each type of account has access g) Procedures for configuring and restricting remote access to various elements of the Toll System h) Description of the security and the access logging facilities and logs generated by each element of the Toll System
TS-01 Requirement #5.5.1-6	The System Administration Manual shall fully describe: a) All programs and processes and the procedures for monitoring each to ensure that the System is operational and troubleshoot problems b) All procedures for validating tasks, processes and jobs have successfully completed, and errors and exceptions encountered c) All procedures for validating the successful transfer and receipt of files for all interfaces and functions of the Host Subsystem, the ORT Zone Subsystem and the Traditional Lane Subsystem with the VDOT E-ZPass Customer Service Center and armored car d) All error codes arranged as a list or table with their meaning, potential associated problems and a step by step guide to troubleshooting each to correct the underlying problem

Contract Criteria	
TS-01 Requirement #5.5.1-7	The System Administration Manual shall contain: a) The database design and all database maintenance procedures recommended or required to keep the Toll System operational, including a recommended schedule for each such procedure b) All detailed procedures for backup, archiving and purging data c) All detailed schedule for all preventative maintenance procedures and activities d) Technical contact lists for all hardware and software providers e) Details and copies of all third-party system support agreements f) Ad-hoc reporting tools and detailed procedures for using such tools to generate ad-hoc reports g) Details of monitoring tools supplied by the Contractor including but not limited to those associated with the Host Subsystem, ORT Zone Subsystem and Traditional Lane Subsystem
TS-01 Requirement #5.5.1-8	This System Administration Manual shall include computer generated listings of all Toll System programs as an addendum under separate cover.

5.5.2. Plaza Supervisor Manual

Contract Criteria	
TS-01 Requirement #5.5.2-1	The Contractor shall develop, furnish and update a Plaza Supervisor Manual as part of the System Manuals.
TS-01 Requirement #5.5.2-2	The Plaza Supervisor Manual shall contain descriptions and appropriate graphics of all functions and procedures required for operation by those in the Authority with supervisory responsibilities.

5.5.3. Toll Collection Attendant Manual

Contract Criteria	
TS-01 Requirement #5.5.3-1	The Contractor shall develop, furnish and update a Toll Collection Attendant Manual as part of the System Manuals.
TS-01 Requirement #5.5.3-2	The Toll Collection Attendant Manual shall contain graphical depictions and detailed explanations of Toll System operation for all operator functions.

Contract Criteria	
TS-01 Requirement #5.5.3-3	The Toll Collection Attendant Manual shall have a section for problems and/or exception conditions so the operator can resolve common operating problems (e.g., troubleshoot network problems, restart the Toll System in the event of a component failure, etc.) and perform normal maintenance.
TS-01 Requirement #5.5.3-4	The Toll Collection Attendant Manual shall include but is not limited to: a) Screen images detailing the step-by-step activities needed to fulfill a specific functionality b) Flowcharts to provide Authority staff a clear understanding of the workflow c) All screens, reports and data fields, clearly explained using sample formats applicable to the System d) Samples of all reports, included either in the manual or as an attachment to the manual, with any specific instructions that may apply to a given report
TS-01 Requirement #5.5.3-5	The Toll Collection Attendant Manual shall be written for instructional, study, and refresher use and shall explain all the features and functions of the Toll System for day-to-day operation (e.g., log-on, monitors, daily reports).

5.5.4. System Maintenance Manual

Contract Criteria	
TS-01 Requirement #5.5.4-1	The Contractor shall develop, furnish and update a System Maintenance Manual as part of the System Manuals.
TS-01 Requirement #5.5.4-2	The System Maintenance Manual shall contain detailed descriptions and appropriate graphics of maintenance activities and procedures for all elements of the Toll System.
TS-01 Requirement #5.5.4-3	The System Maintenance Manual shall include but is not limited to: a) General description of the Toll System and theory of operations b) System block diagrams c) Component diagrams/schematics d) Wiring diagrams e) Detailed electrical/electronic logic circuit analysis f) Fault monitoring processes/procedures g) Remote diagnostic processes/procedures h) Preventive maintenance schedules i) Installation, test, preventive maintenance, troubleshooting and corrective maintenance procedures j) A list of all tools and other equipment required for each such procedure

5.6. Training Materials

Contract Criteria	
TS-01 Requirement #5.6-1	Draft copies of all training materials shall be subject to the Authority's review and approval prior to final printing of quantities required for training.
TS-01 Requirement #5.6-2	The Authority shall have the right to require additional interim drafts at no additional cost should draft training materials submitted not be of adequate quality or have missing or incorrect information.

5.6.1. Instructor Guide

Contract Criteria	
TS-01 Requirement #5.6.1-1	The Contractor shall develop and furnish an instructor guide for each course in section 8 below.
TS-01 Requirement #5.6.1-2	The instructor guide for each course shall include the course agenda; course objective; procedures for managing training session; resource and facilities required, including work stations, power and communications requirements; detailed lesson plans; a detailed list and description of all training aids and items to aid in on the job performance (e.g., where applicable, pocket guides or reference sheets); testing to be administered to assure satisfactory completion; and instructions for using any audio-visual support equipment or materials.
TS-01 Requirement #5.6.1-3	The Contractor shall furnish the instructor guide for each course in electronic form consisting of source files in .DOCX (compatible with Microsoft Word 2010), .XLSX (compatible with Microsoft Excel 2010), or .PPTX (compatible with Microsoft Powerpoint 2010).
TS-01 Requirement #5.6.1-4	The Contractor shall furnish the instructor guide for each course in electronic form consisting of each source file above after conversion to .PDF format for printing on 8.5" by 11" paper.

5.6.2. Training Aids

Contract Criteria	
TS-01 Requirement #5.6.2-1	The Contractor shall develop and furnish training aids for each course in section 8 below.
TS-01 Requirement #5.6.2-2	The Contractor shall develop and furnish training aids such as mock-ups, scale models, files for electronic presentations via a projector system, recorded demonstrations and simulations as are necessary to successfully complete the course agenda and meet the course objective.

Contract Criteria	
TS-01 Requirement #5.6.2-3	The Contractor shall develop and furnish a manual lane terminal simulator suitable for training toll collection attendants.

5.6.3. Student Workbooks

Contract Criteria	
TS-01 Requirement #5.6.3-1	The Contractor shall develop and furnish student workbooks for each course in section 8 below.
TS-01 Requirement #5.6.3-2	Student workbooks shall include but not be limited to course agenda, course objectives, schedule of sessions, copies of all electronic presentations and other visuals and lesson outlines and summaries.
TS-01 Requirement #5.6.3-3	Materials such as System Manuals (see section 5.5 above) may be used to supplement the material provided in the student workbook. If such material is used, appropriate cross-references shall be included in the student workbook so as to identify the complete set of training materials provided to the student.
TS-01 Requirement #5.6.3-4	The Contractor shall provide student workbooks in electronic form consisting of source files in .DOCX (compatible with Microsoft Word 2010), .XLSX (compatible with Microsoft Excel 2010), or .PPTX (compatible with Microsoft Powerpoint 2010).
TS-01 Requirement #5.6.3-5	The Contractor shall provide student workbooks in electronic form consisting of each source file above after conversion to .PDF format for printing on 8.5" by 11" paper.

6. SYSTEM INSTALLATION

Requirements for Contractor installation of the Toll System are described in the TS-03 document.

7. SYSTEM TESTING

	Proposal Criteria
The Offeror shall include in their proposal a summary of no more than two page-sides, describing the testing concept that they are proposing to effectively test the Toll System and specifically describing the process the Contractor will use to ensure timely delivery of a quality product that minimizes risk to the Authority.	

Contract Criteria	
TS-01 Requirement #7-1	The Contractor shall systematically and thoroughly test the Toll System for compliance with all Contract requirements.
TS-01 Requirement #7-2	For all on-site testing involving test vehicles, the Contractor shall perform such testing during off-peak hours or as otherwise approved by the Authority to minimize its impact.
TS-01 Requirement #7-3	For all on-site testing involving lane closures or other maintenance of traffic measures, the Contractor shall perform such testing during off-peak hours or as otherwise approved by the Authority to minimize its impact.
TS-01 Requirement #7-4	The Engineer Of Record shall develop the Maintenance of Traffic plans necessary to support the Contractor's on-site testing activities (see section 11.4 below) and the Contractor shall provide all equipment and personnel necessary to effect these Maintenance of Traffic plans.
TS-01 Requirement #7-5	The Test Manager shall coordinate and supervise all testing.
TS-01 Requirement #7-6	The Quality Manager shall be present for and observe all testing.

Additional testing requirements applicable to a specific Toll System element are detailed in the respective Tolling Specification document (TS-04, TS-05 and TS-06).

Additional requirements specific to a phase of testing are detailed below.

7.1. Factory Acceptance Testing

Prerequisites to Factory Acceptance Testing are detailed in section 4.2.6 above.

Contract Criteria	
TS-01 Requirement #7.1-1	The Authority's only role in Factory Acceptance Test shall be to observe.
TS-01 Requirement #7.1-2	The Contractor shall conduct a Factory Acceptance Test as described in the testing section of the Management Plan (see section 4.3.8 above) and the Detailed Test Procedures (see section 5.4 above) for the Authority to assess: a) The Contractor's design b) Overall readiness for the commencement of installation activities at the Authority's facility
TS-01 Requirement #7.1-3	The Contractor shall provide all test vehicles, E-ZPass transponders, license plates, vehicle drivers and data recording personnel for Factory Acceptance Test.
TS-01 Requirement #7.1-4	The Contractor shall keep a detailed record of all Factory Acceptance Test testing and test results.
TS-01 Requirement #7.1-5	The Contractor shall develop and provide a weekly report to the Authority from the start of Factory Acceptance Test until Factory Acceptance Test is successfully completed.
TS-01 Requirement #7.1-6	These reports shall document the results each time a test procedure is attempted in Factory Acceptance Test, the associated test data, any anomalies identified and the proposed corrective action. These reports shall also identify testing not yet attempted. The proposed corrective action shall be subject to written Authority approval.
TS-01 Requirement #7.1-7	The Contractor shall provide and operate a complete Host Subsystem throughout Factory Acceptance Test that is equipped identically and configured the same as the planned installation at the Authority.
TS-01 Requirement #7.1-8	The Toll System shall operate using the complete interface with the VDOT's E-ZPass Customer Service Center during Factory Acceptance Test and the Contractor shall demonstrate full validation of such interface prior to successful completion of the Factory Acceptance Test Milestone.
TS-01 Requirement #7.1-9	Such validation shall include but is not limited to all testing necessary to prove that the interface between the Toll System and the VDOT E-ZPass Customer Service Center meets all stated requirements including but not limited to those specified in the Tolling Specification document for the Host Subsystem (TS-04) and the SDR document (see section 5.2 above).
TS-01 Requirement #7.1-10	Such validation shall include but is not limited to all testing necessary to prove all manual data on-load and off-load operations at the Host Subsystem, ORT Zone Subsystem and Traditional Lane Subsystem.

Contract Criteria	
TS-01 Requirement #7.1-11	The Contractor shall provide and operate the Toll System's complete DVAS function throughout Factory Acceptance Test. Such DVAS function shall be equipped identically and configured the same as the installation planned for the DTE ORT zone and the traditional lanes at the Powhite Parkway northbound mainline plaza.
TS-01 Requirement #7.1-12	The Contractor shall provide and operate the Toll System's complete MOMS function throughout Factory Acceptance Test. Such DVAS function shall be equipped identically and configured the same as the installation planned for the DTE ORT zone and the traditional lanes at the Powhite Parkway northbound mainline plaza.
TS-01 Requirement #7.1-13	The Contractor shall conduct Factory Acceptance Testing so as to demonstrate that the Toll System will be compatible with other E-ZPass members.
TS-01 Requirement #7.1-14	The Contractor shall conduct all reasonable ad hoc testing requested by the Authority.
TS-01 Requirement #7.1-15	Authority approval of any aspect of testing shall not relieve the Contractor of the responsibility to meet all requirements of the Toll System.

Subsystem-specific Factory Acceptance Test requirements are detailed in the subsystem's respective Tolling Specification (e.g. TS-04, TS-05 or TS-06) document.

7.2. Revenue Service Acceptance Testing
Prerequisites to Revenue Service Acceptance Testing are detailed in section 4.2.9 above.

Contract Criteria	
TS-01 Requirement #7.2-1	The Authority's only role in Revenue Service Acceptance Test shall be to observe.

Contract Criteria	
TS-01 Requirement #7.2-2	The Contractor shall conduct Revenue Service Acceptance Test as described in the testing section of the Management Plan (see section 4.3.8 above) and the Detailed Test Procedures (see section 5.4 above) for the Authority to assess the ability of the Toll System, System Operation services (see section 9 below) and System Maintenance services (see section 10 below) to meet all Contract requirements including but not limited to: a) Effectively processing, storing and forwarding all records to VDOT's E-ZPass Customer Service Center b) Effectively receiving, storing and processing all associated reconciliation files c) Appropriately accounting for and reporting these transactions d) Supporting the audit of these transactions e) Supporting the VDOT E-ZPass Customer Service Center's resolution of motorist disputes
TS-01 Requirement #7.2-3	The Contractor shall conduct Revenue Service Acceptance Test as described in the testing section of the Management Plan (see section 4.3.8 above) and the Detailed Test Procedures (see section 5.4 above) for the Authority to assess the operation of the Host Subsystem, the ORT Zone Subsystem and the Traditional Lane Subsystem and to evaluate their ability to operate fully and continuously during all tolling hours with minimal manual intervention.
TS-01 Requirement #7.2-4	The Contractor shall provide all test vehicles, E-ZPass transponders, license plates, vehicle drivers and data recording personnel for Revenue Service Acceptance Test.
TS-01 Requirement #7.2-5	The Contractor shall provide all signage and other materials, equipment and personnel for maintenance of traffic during Revenue Service Acceptance Test where controlled test environments are required.
TS-01 Requirement #7.2-6	The Contractor shall conduct Maintenance of Traffic in accordance with the current Virginia Work Area Protection Manual and ensure that all Contractor personnel on-site for Revenue Service Acceptance Test and related activities are appropriately trained and certified.
TS-01 Requirement #7.2-7	The Contractor shall have the Engineer Of Record oversee all set up, operation and removal of signage and other materials, equipment and personnel for Maintenance of Traffic during Revenue Service Acceptance Test.
TS-01 Requirement #7.2-8	The Contractor shall keep a detailed record of all Revenue Service Acceptance Test testing and test results.
TS-01 Requirement #7.2-9	The Contractor shall develop and provide a weekly report to the Authority from the start of Revenue Service Acceptance Test until Revenue Service Acceptance Test is successfully completed.

Contract Criteria	
TS-01 Requirement #7.2-10	These reports shall document the results each time a test procedure is attempted in Revenue Service Acceptance Test, the associated test data, any anomalies identified and the proposed corrective action. These reports shall also identify testing not yet attempted. The proposed corrective action shall be subject to written Authority approval.
TS-01 Requirement #7.2-11	As part of Revenue Service Acceptance Test, the Contractor shall perform all testing necessary to prove that the interface between the Toll System and the VDOT E-ZPass Customer Service Center meets all requirements including but not limited to those specified in the Tolling Specification document for the Host Subsystem (TS-04) and the SDR document (see section 5.2 above) and complies with the System Detailed Design Document (see section 5.3 above).
TS-01 Requirement #7.2-12	As part of Revenue Service Acceptance Test, the Contractor shall conduct comprehensive testing of all Host Subsystem functions described in the TS-04 document and the System Detailed Design document (see section 5.3 above) as part of the Revenue Service Acceptance Test. These functions include, but are not limited to, those related to: a) ORT Zone Subsystem functions b) Traditional Lane Subsystem functions c) The E-ZPass Customer Service Center interface d) Armored car
TS-01 Requirement #7.2-13	As part of Revenue Service Acceptance Test, the Contractor shall conduct comprehensive testing of all ORT Zone Subsystem function.
TS-01 Requirement #7.2-14	As part of Revenue Service Acceptance Test, the Contractor shall conduct comprehensive testing of all Traditional Lane Subsystem function.
TS-01 Requirement #7.2-15	As part of Revenue Service Acceptance Test, the Contractor shall conduct comprehensive testing of all MOMS functions described in the TS-04, TS-05 and TS-06 documents and the System Detailed Design document (see section 5.3 above) as part of the Revenue Service Acceptance Test.
TS-01 Requirement #7.2-16	As part of Revenue Service Acceptance Test, the Contractor shall conduct comprehensive testing of all Toll System DVAS functions described in the TS-04, TS-05 and TS-06 documents and the System Detailed Design document (see section 5.3 above) as part of the Revenue Service Acceptance Test.
TS-01 Requirement #7.2-17	The Contractor shall perform all testing necessary to prove the Toll System is compatible with and acceptable to all other E-ZPass members.
TS-01 Requirement #7.2-18	Authority approval of any aspect of testing shall not relieve the Contractor of the responsibility to meet all requirements of the Toll System.

7.3. Project Acceptance Testing

The Project Acceptance Test is intended to confirm that the Toll System is sized and configured correctly and data is processed without interruption.

Contract Criteria	
TS-01 Requirement #7.3-1	The Authority's only role in Project Acceptance Test shall be to observe.
TS-01 Requirement #7.3-2	The Project Acceptance Test shall confirm the Toll System functions over the test period with limited manual intervention in live operations.
TS-01 Requirement #7.3-3	The Contractor shall commence Project Acceptance Test three (3) months or more after successfully completing Revenue Service Acceptance Test.
TS-01 Requirement #7.3-4	The Contractor shall keep a detailed record of all Project Acceptance Test testing and test results.
TS-01 Requirement #7.3-5	The Contractor shall develop and provide a weekly report to the Authority from the start of Project Acceptance Test until Project Acceptance Test is successfully completed.
TS-01 Requirement #7.3-6	These reports shall document the results each time a test procedure is attempted in Project Acceptance Test, the associated test data, any anomalies identified and the proposed corrective action. These reports shall also identify testing not yet attempted. The proposed corrective action shall be subject to written Authority approval.
TS-01 Requirement #7.3-7	The Contractor shall conduct a Project Acceptance Test as described in the testing section of the Management Plan (see section 4.3.8 above) and the Detailed Test Procedures (see section 5.4 above) for the Authority to assess completion of the Toll System and successful deployment of System Operation services (see section 9 below) and System Maintenance services (see section 10 below).
TS-01 Requirement #7.3-8	As part of Project Acceptance Test, the Contractor shall perform all testing necessary to prove that the interface between the Toll System and the VDOT E-ZPass Customer Service Center meets all stated requirements including but not limited to those specified in the Tolling Specification document for the Host Subsystem (TS-04) and the SDR document (see section 5.2 above). Such testing includes but is not limited to "live traffic" testing.
TS-01 Requirement #7.3-9	The Contractor shall monitor Toll System accuracy, performance, reliability and auditability in live traffic operations for at least sixty (60) days as part of the Project Acceptance Test.
TS-01 Requirement #7.3-10	The Project Acceptance Test shall validate System reliability and auditability manually and through tools and reports provided in the System.

Contract Criteria	
TS-01 Requirement #7.3-11	The Project Acceptance Test shall validate all dashboards and reports daily for accuracy and reconciled to operations and interface files. Test activities shall include traffic observation and the generation of Toll System queries to validate file transmissions and the daily, weekly, monthly and yearly reports.
TS-01 Requirement #7.3-12	The Project Acceptance Test shall verify all alarms displayed by the MOMS function and all interface status notification to be accurate.
TS-01 Requirement #7.3-13	The Project Acceptance Test shall fully exercise the Toll System's DVAS function with "live traffic".
TS-01 Requirement #7.3-14	The Project Acceptance Test shall clearly demonstrate that the Toll System is capable of meeting performance requirements. Failure of the Toll System to meet a performance requirement shall result in the restart of that particular test until such time the accuracy requirements are met.
TS-01 Requirement #7.3-15	As part of the Project Acceptance Test, the Contractor shall be on-site at the Authority's facilities to observe and provide guidance during the first two (2) monthly audit cycles of the Toll System.
TS-01 Requirement #7.3-16	The Project Acceptance Test shall clearly demonstrate that all functional elements of the Toll System and components provided by the Contractor are in conformance with the Authority's technical and operational requirements and the Installation-Ready Design Review Submittal as approved in principle by the Authority.
TS-01 Requirement #7.3-17	The Contractor shall provide all signage and other materials, equipment and personnel for maintenance of traffic during Project Acceptance Test where controlled test environments are required.
TS-01 Requirement #7.3-18	The Contractor shall conduct Maintenance of Traffic in accordance with the current Virginia Work Area Protection Manual and ensure that all Contractor personnel on-site for Project Acceptance Test and related activities are appropriately trained and certified.
TS-01 Requirement #7.3-19	The Contractor shall have the Engineer Of Record oversee all set up, operation and removal of signage and other materials, equipment and personnel for Maintenance of Traffic during Project Acceptance Test.
TS-01 Requirement #7.3-20	The Contractor shall perform all testing necessary to prove the Toll System is compatible with and acceptable to all other E-ZPass members.
TS-01 Requirement #7.3-21	Authority approval of any aspect of testing shall not relieve the Contractor of the responsibility to meet all requirements of the Toll System.

8. SYSTEM TRAINING

Proposal Criteria
The Offeror shall include in their proposal a summary of no more than two (2) page-sides, describing the training concept and approach that they are proposing to meet the following requirements.

Where practical and useful, all instruction provided by the Contractor shall be hands on and use actual Toll System logic flows, screens and other actual Toll System elements.

Contract Criteria	
TS-01 Requirement #8-1	The Contractor shall train and provide all instructional personnel for the following courses.

8.1. System Operation Overview Course

Contract Criteria	
TS-01 Requirement #8.1-1	The Contractor shall develop a course titled "System Operation Overview".
TS-01 Requirement #8.1-2	The Contractor shall develop and furnish Training Materials for this System Operation Overview course, where such materials include but are not limited to: a) An Instructor Guide (see section 5.6.1 above) b) Training Aids (see section 5.6.2 above) consisting of both classroom material and material for self-study refresher use c) Student Workbooks (see section 5.6.3 above) d) System Manuals (section 5.5 above)
TS-01 Requirement #8.1-3	The Contractor shall deliver two (2) sessions of this System Operation Overview course at the Authority's facilities with a class size per session of up to five (5) people.
TS-01 Requirement #8.1-4	This System Operation Overview course shall provide training that results in a general understanding of all aspects of the operation of the Toll System.
TS-01 Requirement #8.1-5	This System Operation Overview course shall consist of a minimum of sixteen (16) hours of training per session.
TS-01 Requirement #8.1-6	This System Operation Overview course's intended audience includes senior management and other Authority personnel with procurement, information technology, marketing and public information responsibilities.

8.2. System Audit Course

Contract Criteria	
TS-01 Requirement #8.2-1	The Contractor shall develop a course titled "System Audit".
TS-01 Requirement #8.2-2	The Contractor shall develop and furnish Training Materials for the System Audit course, where such materials include but are not limited to: a) An Instructor Guide (see section 5.6.1 above) b) Training Aids (see section 5.6.2 above) consisting of both classroom material and material for self-study refresher use c) Student Workbooks (see section 5.6.3 above) d) System Manuals (section 5.5 above)
TS-01 Requirement #8.2-3	The Contractor shall deliver two (2) sessions of this System Audit course at the Authority's facilities with a class size per session of up to five (5) people.
TS-01 Requirement #8.2-4	This System Audit course shall provide training in all aspects of the Toll System audit functions and tools, particularly those related to financial accounting, reconciliation and management.
TS-01 Requirement #8.2-5	This System Audit course shall consist of a minimum of twenty-four (24) hours of training per session and at least eight (8) hours of each such session shall be taught by the manufacturer of the COTS ad hoc reporting software described in the TS-04 document.
TS-01 Requirement #8.2-6	This System Audit course's intended audience includes the Authority's financial management and auditing staff.

8.3. Toll Collection Attendant Course

Contract Criteria	
TS-01 Requirement #8.3-1	The Contractor shall develop a course titled "Toll Collection Attendant Course".
TS-01 Requirement #8.3-2	The Contractor shall develop and furnish Training Materials for this Toll Collection Attendant Course, where such materials include but are not limited to: a) An Instructor Guide (see section 5.6.1 above) b) Training Aids (see section 5.6.2 above) consisting of both classroom material and material for self-study refresher use c) Student Workbooks (see section 5.6.3 above) d) System Manuals (section 5.5 above)

Contract Criteria	
TS-01 Requirement #8.3-3	The Contractor shall deliver four (4) sessions of this Toll Collection Attendant Course at the Authority's facilities with a class size per session of up to ten (10) people to directly train toll collection attendants.
TS-01 Requirement #8.3-4	The Contractor shall deliver one (1) session of this Toll Collection Attendant Course at the Authority's facilities with a class size per session of up to ten (10) people in a "teach the teacher" format.
TS-01 Requirement #8.3-5	This Toll Collection Attendant Course shall provide detailed training in how to use the Toll System to: a) Monitor the Toll System's operation b) Access information and reports from the system on items such as status, alarms, performance, transactions and revenue c) Monitor the Toll System processes for assembling, storing and forwarding transactions and violations to VDOT's E-ZPass Customer Service Center d) Supporting the VDOT E-ZPass Customer Service Center in resolving customer disputes
TS-01 Requirement #8.3-6	This Toll Collection Attendant Course shall address both typical Toll System operation and operation of the Toll System in degraded mode; operation of the Toll System in atypical traffic scenarios including traffic related incidents; and operation of the Toll System in atypical weather conditions.
TS-01 Requirement #8.3-7	This Toll Collection Attendant Course shall consist of a minimum of twenty-four (24) hours of training per session.
TS-01 Requirement #8.3-8	This Toll Collection Attendant Course's intended audience includes the Authority's project management and information technology personnel.

8.4. System Administrator Course

Contract Criteria	
TS-01 Requirement #8.4-1	The Contractor shall develop a course titled "System Administrator".
TS-01 Requirement #8.4-2	The Contractor shall develop and furnish Training Materials for this System Administrator course, where such materials include but are not limited to: a) An Instructor Guide (see section 5.6.1 above) b) Training Aids (see section 5.6.2 above) consisting of both classroom material and material for self-study refresher use c) Student Workbooks (see section 5.6.3 above) d) System Manuals (section 5.5 above)

Contract Criteria	
TS-01 Requirement #8.4-3	The Contractor shall deliver two (2) of this System Administrator course at the Authority's facilities with a class size per session of up to five (5) people.
TS-01 Requirement #8.4-4	This System Administrator course shall provide detailed training in the monitoring, management, troubleshooting and administration of the software, database, applications, configurations and other software aspects of the Toll System
TS-01 Requirement #8.4-5	This System Administrator course shall consist of a minimum of sixteen (16) hours of training per session.
TS-01 Requirement #8.4-6	This System Administrator course's intended audience includes the Authority's staff who will oversee the Contractor in the monitoring and management of the Toll System operations.

8.5. System Maintenance Course

A Toll System maintenance course is not required.

9. SYSTEM OPERATIONS

Requirements for Contractor operation of the Toll System are described in the TS-02 document.

10. SYSTEM MAINTENANCE

Requirements for Contractor maintenance of the Toll System are described in the TS-02 document.

11. ENGINEER OF RECORD

Proposal Criteria
As part of their proposal, the Offeror shall identify the individual(s) proposed as Engineer Of Record.
The Offeror shall provide a resume or similar background document in their proposal describing the structural, electrical and other applicable engineering education, experience and credentials for each such individual.
The Offeror shall provide a copy of the Professional Engineering license issued by the Commonwealth of Virginia for each such individual as part of their proposal.

Contract Criteria	
TS-01 Requirement #11-1	The Contractor shall provide and be responsible for a Professional Engineer(s) authorized to practice engineering in accordance with the laws of the Commonwealth Of Virginia and having discipline-specific expertise in electrical, environmental, structural and traffic engineering.

Contract Criteria	
TS-01 Requirement #11-2	Said Professional Engineer(s) shall be the Engineer of Record (EOR) for all engineering work under this Contract including but not limited to: a) All electrical power assessment, design and field oversight work b) All communications assessment, design and field oversight work c) All equipment mounting assessment, design and field oversight work d) All assessment, design and field oversight work related to Maintenance of Traffic during installation and testing of any element of the Toll System e) All assessment, abatement design and field oversight work related to hazardous materials in the work areas
TS-01 Requirement #11-3	Any change of such Engineer Of Record shall be subject to the Authority's approval.

11.1.   Health and Safety Plan

The Engineer Of Record shall develop and provide a comprehensive Health and Safety Plan document.

Contract Criteria	
TS-01 Requirement #11.1-1	The Health and Safety Plan shall be prepared by the Engineer Of Record; shall fully describe all Contractor procedures for ensuring personal safety; and shall index to all applicable OSHA, NEC, NFPA, Commonwealth of Virginia standards.
TS-01 Requirement #11.1-2	The Contractor shall provide all health and safety training of the Contractor's employees and subcontractors.
TS-01 Requirement #11.1-3	The Engineer Of Record shall oversee all health and safety training of the Contractor's employees and subcontractors.
TS-01 Requirement #11.1-4	The Engineer Of Record shall notify the Authority immediately when conditions affecting the Health and Safety Plan document change.
TS-01 Requirement #11.1-5	The Engineer Of Record shall provide an updated Health and Safety Plan document within two (2) weeks of such change in conditions.

11.2. Field Surveys

Contract Criteria	
TS-01 Requirement #11.2-1	The Contractor shall request authorization from the Authority for each field survey and said authorization will not be unreasonably withheld.
TS-01 Requirement #11.2-2	Upon receiving authorization for a field survey, the Contractor shall have the Engineer Of Record shall oversee each field survey.

11.3. Infrastructure Documentation

Proposal Criteria
The Offeror shall include in their proposal a summary of no more than one page-side, describing their approach to developing and updating infrastructure documentation and how this approach will address the requirements below. This description shall include all document approval and control procedures and shall address the review cycles and impact on schedule.

11.3.1. Detailed Design Calculations

Contract Criteria	
TS-01 Requirement #11.3.1-1	The Contractor shall have the Engineer Of Record prepare and approve all calculations required to assess the installation of the Toll System (hereafter Detailed Design Calculations).

TS-01 Requirement #11.3.1-2	The Engineer Of Record shall prepare and update Detailed Design Calculations including but not limited to analysis:
	
	• Proving that all Toll System elements mounted to the gantry:
	  o Do not exceed the safe design limits of the gantry
	  o Remain sufficiently secured
	  o Accommodate the dynamic response characteristics of the gantry design when mounted according to the Detailed Design Drawings
	• Proving that all Toll System elements comply with their manufacturer's storage and operating climate specifications when installed in their respective Enclosure
	• Of Conduit ratings, applications and fill percentages
	• Of Cabling ratings and application

TS-01 Requirement #11.3.1-3	The Contractor shall furnish all Detailed Design Calculations in electronic form consisting of source files in .DOCX (compatible with Microsoft Word 2010) or .XLSX (compatible with Microsoft Excel 2010).

Contract Criteria	
TS-01 Requirement #11.3.1-4	The Contractor shall furnish all Detailed Design Calculations in electronic form consisting of a copy of each source file above after conversion to .PDF format for printing on 8.5" by 11" paper.

Requirements for the Engineer Of Record to sign and emboss copies of the Detailed Design Calculations are described in sections 4.2.7 and 4.2.11 above.

Additional requirements for Detailed Design Calculations are specified in the TS-03 document and in the Tolling Specifications document specific to a subsystem (e.g. TS-04, TS-05 orTS-06).

11.3.2. Detailed Design Specifications

Contract Criteria	
TS-01 Requirement #11.3.2-1	The Contractor shall have the Engineer Of Record prepare and approve all specifications for the installation of all Toll System elements (hereafter Detailed Design Specifications).
TS-01 Requirement #11.3.2-2	Detailed Design Specifications shall contain all specifications required to procure, assemble, integrate and validate all Toll System elements (hereafter Detailed Design Specifications).
TS-01 Requirement #11.3.2-3	The Contractor shall furnish all Detailed Design Specifications in electronic form consisting of source files in .DOCX (compatible with Microsoft Word 2010) or .XLSX (compatible with Microsoft Excel 2010).
TS-01 Requirement #11.3.2-4	The Contractor shall furnish all Detailed Design Specifications in electronic form consisting of a copy of each source file above after conversion to .PDF format for printing on 8.5" by 11" paper.

Requirements for the Engineer Of Record to sign and emboss copies of the Detailed Design Specifications are described in sections 4.2.7 and 4.2.11 above.

Additional requirements for Detailed Design Specifications are specified in the TS-03 document and in the Tolling Specifications document specific to a subsystem (e.g. TS-04, TS-05 or TS-06).

11.3.3. Detailed Design Drawings

Contract Criteria	
TS-01 Requirement #11.3.3-1	The Contractor shall have the Engineer Of Record prepare and approve all Detailed Design Drawings.

Contract Criteria	
TS-01 Requirement #11.3.3-2	The Engineer Of Record shall prepare and update Detailed Design Drawings including but not limited to: • Plans showing the locations of all Toll System elements (furnished by the Contractor), element layout, physical dimensions and tolerances • Demarcation points and adjoining items furnished by others • One line diagrams • System block diagrams • All Panel Board hardware and installation • Panel Board schedules • Equipment, installation and mounting details • Enclosures, installation and mounting details • Interior layouts of Enclosures • All Conduit routings, pull box, junction box, other Enclosure, Mounting Hardware and elevations showing details of installation work • Cabling types and sizes • Point to point field wiring diagrams • Schematics of circuits and interconnect wiring diagrams • Other drawings as may be required by the Contractor's design
TS-01 Requirement #11.3.3-3	The Detailed Design Drawings shall catalog and cross-reference the entire Toll System to the exact location of the element, assembly, subassembly or part in the Toll System.
TS-01 Requirement #11.3.3-4	The Detailed Design Drawings shall call for the Contractor to purchase new, furnish and install all Toll System elements.
TS-01 Requirement #11.3.3-5	The Detailed Design Drawings shall identify element designations, part numbers and two (2) sources of supply for all field replaceable elements of the Toll System.
TS-01 Requirement #11.3.3-6	The Engineer Of Record shall provide the following with all Detailed Design Drawings showing any equipment that is not readily available to the Authority as a Commercial Off The Shelf item or not readily available to the Authority independently from a second source: • Detailed narratives of the manufacturing, assembly, test and troubleshooting processes and all supporting drawings for said item • A perpetual royalty free license for the Authority to use, copy, modify and copy said modifications of said narratives and drawings and have others do the same for the Authority's benefit • A perpetual royalty free license for the Authority to repair, construct, modify and use each said item or to have others do the same for the Authority's benefit

Contract Criteria	
TS-01 Requirement #11.3.3-7	All Detailed Design Drawings and all Shop Drawings shall call out and describe the positive mechanical means of preventing slippage or other movement of all Toll System elements and said means shall be subject to the Authority's approval.
TS-01 Requirement #11.3.3-8	The Detailed Design Drawings shall identify all items furnished by the Contractor, all existing items to be removed by the Contractor and all existing items to be re-used by the Contractor.
TS-01 Requirement #11.3.3-9	The Detailed Design Drawings shall describe and specify all temporary lighting used for on-site installation, tuning, testing and maintenance of the Toll System.
TS-01 Requirement #11.3.3-10	The Detailed Design Drawings shall describe and specify all Maintenance Of Traffic equipment, personnel, equipment, supplies and other materials used during on-site installation, tuning, testing and maintenance of the Toll System.
TS-01 Requirement #11.3.3-11	Contractor shall have the Engineer Of Record prepare and approve specifications and drawings such that they do not contain conflicting information. In the event conflicting information is found, the requirements shown on Detailed Design Drawings shall supersede the requirements contained in the Detailed Design Specifications.
TS-01 Requirement #11.3.3-12	The Contractor shall furnish all Detailed Design Drawings in electronic form consisting of source files in .DGN format.
TS-01 Requirement #11.3.3-13	The Contractor shall furnish all Detailed Design Drawings in electronic form consisting of a copy of each source file above after conversion to .PDF format for printing on 34" by 44" paper.
TS-01 Requirement #11.3.3-14	The Contractor shall furnish all Detailed Design Drawings in electronic form consisting of a copy of each source file above after conversion to .PDF format for printing on 11" x 17" paper.
TS-01 Requirement #11.3.3-15	The Contractor shall provide the following in electronic format with each submittal of Detailed Design Drawings: a) A list that cross-references the CAD file names to the actual drawing numbers b) A list mapping the various colors used to their corresponding plotted line-weights and line-types

Requirements for the Engineer Of Record to sign and emboss copies of the Detailed Design Drawings are described in sections 4.2.7 and 4.2.11 above. Additional requirements for Detailed Design Drawings are specified in the TS-03 document and in the Tolling Specifications document specific to a subsystem (e.g. TS-04, TS-05 or TS-06).

11.3.4. Shop Drawings

Contract Criteria	
TS-01 Requirement #11.3.4-1	The Contractor shall have the Engineer Of Record prepare all assembly drawings, catalog cuts, samples, other drawings, means and methods of installation, and other materials to describe the proposed configuration of materials and equipment to be furnished and installed by the Contractor as the Engineer Of Record may deem necessary to supplement the Detailed Design Drawings and Detailed Design Specifications. These documents and drawings shall hereafter be collectively referred to as Shop Drawings.
TS-01 Requirement #11.3.4-2	The Shop Drawings shall describe and detail all: • System elements • Electrical interfaces • Communications Cabling • Communications interface devices • Communications protocols, connectors and ports • UPS subsystem • Batteries • Power supplies • Transformers • Power Cabling • Conduit • Enclosures and boxes • Manholes and hand holes • Panel boards and circuit breakers • Outlets • Switches, pushbuttons and relays • Indicators and signaling devices • Terminal blocks • Equipment mountings, brackets and fasteners
TS-01 Requirement #11.3.4-3	The Shop Drawings shall include but are not limited to: • Exterior and interior layouts of all equipment cabinets, including a complete list of all items contained therein • Wiring diagrams for all equipment, including point-to-point wiring diagrams indicating the wiring to be performed at the factory and in the field • Equipment interconnection diagrams
TS-01 Requirement #11.3.4-4	All Shop Drawings shall call out and describe the positive mechanical means of preventing slippage or other movement of all Toll System elements and said means shall be approved by the Engineer Of Record prior to any installation work.

Contract Criteria	
TS-01 Requirement #11.3.4-5	Shop Drawings which are inconsistent with the requirements of the accepted Detailed Design Drawings or Detailed Design Specifications shall not be deemed to waive or change such requirements or to relieve the Contractor of his obligations to perform to such requirements unless the Authority expressly and specifically states that the Authority is waiving or changing such requirements. Such statement shall be effective only if in a writing separate from the approval and identifying the specific requirements to be waived or changed.
TS-01 Requirement #11.3.4-6	The Contractor assumes the risk that if such Shop Drawing is not equivalent to that shown or specified in the Detailed Design Drawings and Detailed Design Specifications and if at any time any Shop Drawing shall not appear to be so equal, the Contractor shall replace work installed under such Shop Drawing at the Contractor's own expense and reimburse the Authority for any loss occurring on account of the work failing to be so equal, notwithstanding that the Shop Drawing had been previously approved for use.
TS-01 Requirement #11.3.4-7	Contractor shall have the Engineer Of Record prepare and approve drawings such that they do not contain conflicting information. In the event conflicting information is found, the requirements shown on Detailed Design Drawings or contained in Detailed Design Specifications shall supersede the requirements shown on Shop Drawings.
TS-01 Requirement #11.3.4-8	The Contractor shall submit all Shop Drawings in electronic form in .PDF format and the Contractor may adopt a sheet of any size which best suits the Contractor's needs and is acceptable to the Authority, but having adopted such size acceptable to the Authority, all sheets of a similar nature shall be the same size.

Requirements for the Engineer Of Record to sign and emboss copies of the Shop Drawings are described in sections 4.2.7 and 4.2.11 above. Additional requirements for Shop Drawings are specified in the TS-03 document and in the Tolling Specifications document specific to a subsystem (e.g. TS-04, TS-05 and TS-06).

11.4. Maintenance Of Traffic

Requirements for the Engineer Of Record to prepare drawings for maintenance of traffic (as part of the Detailed Design Drawings) are detailed in section 11.3.3 above. Requirements for the Engineer Of Record to sign and emboss copies of these drawings are described in section 4.2.7 and 4.2.11 above.

Additional Maintenance Of Traffic requirements are detailed for:
- Systems installation in section 11.3.3 above and in the TS-03 document
- Systems testing in sections 7 and 11.3.3 above
- Systems maintenance in section 11.3.3 above and in the TS-02 document

12. EXTRA WORK

Contract Criteria	
TS-01 Requirement #12-1	Any Extra Work authorized by the Authority shall be managed by the Contractor in accordance with all requirements in sections 1 through 11 above.

Extra Work is defined in the Contract and further described in Tolling Specification #02.

TS-02

Tolling Specification #02: Operations & Maintenance Work

TOLLING SPECIFICATION #02:
OPERATIONS AND MAINTENANCE WORK

TABLE OF CONTENTS

1. ACRONYMS & KEY TERMS

Acronyms and key terms are defined in Tolling Specification #01.

2. OVERVIEW

This Tolling Specification document (TS-02) describes the Contractor's operations and maintenance responsibilities.

3. SINGLE POINT OF CONTACT

Contract Criteria	
TS-02 Requirement #3-1	The Operations & Maintenance Manager (O&M Manager) shall coordinate and oversee the delivery of all services specified in this Tolling Specification #02 document after Revenue Service Acceptance Test commences.
TS-02 Requirement #3-2	The O&M Manager shall serve as the Authority's point of contact for all communications between the Authority and the Contractor after the Authority fully releases the Performance Bond.

4. ON-SITE STAFFING

Contract Criteria	

TS-02 Requirement #4-1	At a minimum, the Contractor shall provide one (1) maintenance person on-site at each of the following locations at the times prescribed below:
	
	• The Authority's Downtown Expressway plaza from:
	   o 6:00 a.m. to 9:30 a.m. on weekdays
	   o 3:00 p.m. to 7:00 p.m. on weekdays
	• The Authority's Powhite Parkway plazas from:
	   o 6:00 a.m. to 9:30 a.m. on weekdays
	   o 3:00 p.m. to 7:00 p.m. on weekdays
	
	Wherever one of the six core Authority holidays falls on a weekday, the Contractor may reduce that day's coverage to one maintenance person in total during the hours prescribed above.

TS-02 Requirement #4-2	In all cases, each maintenance person described above shall be a reasonably skilled technician in the field of electrical/electronic maintenance; be properly trained to comprehensively monitor Toll System status and alarms; and be properly trained to provide any and all maintenance of the Toll System including but not limited to preventive maintenance, troubleshooting, corrective maintenance, adjustment and validation.

The dedicated on-site personnel described above will rapidly respond to and resolve all Toll System failures and degradation, including but not limited to those caused by debris being placed in the ACMs, to achieve the Key Performance Indicators in Appendix A of this TS-02 document.

5. OPERATIONS WORK

The following requirements may be met through any combination of direct on-site work hours, on-call availability and remote access that the Contractor deems most suitable.

Proposal Criteria
The Offeror shall include in their proposal a detailed description of their understanding of the Contractor's operations related work including but not limited to: • Work described in sections 5.1 through 5.7 below • Completeness and delivery times for the described work • Management activities, levels and locations of staffing, facilities and automation anticipated to achieve the described work completeness and delivery times • Key Performance Indicators and price adjustments related to work completeness and delivery times

5.1. Management

As part of the Management Plan (see Tolling Specification #01), the Contractor detailed their methodology for managing operations and maintenance of the Toll System as a mission-critical system.

Contract Criteria	
TS-02 Requirement #5.1-1	The Contractor shall manage all Operations and Maintenance Work (O&M Work) in accordance with the Management Plan. Applicable sections of the Management Plan include but are not limited to: • Quality • Security • Configuration and Change Management • Software Development • Testing • Training • Operations and Maintenance • Bill Of Materials
TS-02 Requirement #5.1-2	After Revenue Service Acceptance Test is successfully completed in a traditional lane or ORT zone, the Contractor shall obtain the express written approval of the Authority for such lane or zone before: • Performing any adjustment or tuning or testing task that is not described in the Maintenance Plan as a regularly scheduled task • Substituting any equipment with another make, model or feature set • Upgrading or otherwise changing any software, middleware, or firmware on Toll System equipment

5.1.1. Quality

Contract Criteria	
TS-02 Requirement #5.1.1-1	Any procurement, manufacturing, fabrication, assembly, development, integration, and test work associated with these activities shall be controlled completely by the Contractor according to the Quality section of the Management Plan.
TS-02 Requirement #5.1.1-2	The Contractor shall make objective evidence of quality conformance readily available to the Authority upon request.
TS-02 Requirement #5.1.1-3	The Contractor shall provide tools, resources and other items necessary to assist the Authority's periodic and ad hoc audits of Toll System performance, Contractor work and reported revenue.

5.1.2. Meetings

Contract Criteria	
TS-02 Requirement #5.1.2-1	The Contractor shall schedule and conduct regular meetings electronically via telephone conference calls or in-person at an Authority selected site no less frequently than on a weekly basis. The purpose of these meetings shall include but is not limited to: • Track the status of the Contractor's O&M Work activities • Review all issues identified, tickets created, their severity, their prioritization and the schedule for each issue's correction, validation and release to production • Review the Contractor's performance using the Key Performance Indicators (see section 10 below) and other metrics • Review the Contractor's invoices for services provided • Report or communicate on availability of all toll collection services and the environment directly impacting these services • Resolve disputes At the sole discretion of the Authority, the Authority may attend these meetings and adjust the frequency of these meetings.
TS-02 Requirement #5.1.2-2	The Contractor shall participate in all other meetings scheduled by the Authority as necessary for resolution of tolling operations issues and concerns.

5.1.3. Record Keeping

Contract Criteria	
TS-02 Requirement #5.1.3-1	The Contractor shall keep a searchable electronic log of all O&M Work related activities performed by the Contractor and such log shall be accessible by the Authority at all times. The Authority prefers (but does not require) that this electronic log be part of the Toll System's MOMS function.
TS-02 Requirement #5.1.3-2	The Contractor shall record the stop and start times of all Toll System field maintenance activities in said electronic log within five (5) minutes of when each occurs.
TS-02 Requirement #5.1.3-3	The Contractor shall record all other work activities in said electronic log within twenty-four (24) hours of their occurrence.
TS-02 Requirement #5.1.3-4	The Contractor shall maintain an inventory of all COTS software in said electronic log including but not limited to the following information: - The type and status of license for each COTS software element including but not limited to license expiration date (if any) and the dates when manufacturer support will change or end - All patches or other changes to each COTS software element released by its respective manufacturer. - The date where each such patch or change was applied to the Toll System Other Contractor responsibilities related to software licensing, patches and changes are described in section 6 below and its subsections.
TS-02 Requirement #5.1.3-5	The Contractor shall maintain an inventory of Toll System documentation (as detailed in Tolling Specification #01) in said electronic log. This inventory shall detail the current version and publication date of the: - Bill of Materials - System Design Document (SDD) - Detailed Test Procedures document - System Administrator Manual - Supervisor Manual - User Manual - System Maintenance Manual Other Contractor responsibilities related to these various documents are detailed in section 5.5 below.
TS-02 Requirement #5.1.3-6	The Contractor shall retain all information and findings from scheduled and ad hoc security audits of the Toll System (see section 5.1.5 below) in said electronic log and furnish copies of same to the Authority upon request.

Contract Criteria	
TS-02 Requirement #5.1.3-7	The Contractor shall retain all failure analysis related documentation and furnish copies of same to the Authority upon request.
TS-02 Requirement #5.1.3-8	The Contractor shall retain all proof of purchase and payment in the form of dated invoice, shipping bills and payment receipts and furnish un-redacted copies of same to the Authority upon request.

5.1.4. Reporting

Contract Criteria	
TS-02 Requirement #5.1.4-1	The Contractor shall provide the Authority with and post a weekly schedule identifying personnel and times of mandatory on-site staffing (see section 4 above), other personnel on-site and additional resources available on-site at the Authority's facilities and remotely for maintenance activities. The schedule shall separately identify the personnel and times of who is available on a call-in basis and remotely for maintenance activities.
TS-02 Requirement #5.1.4-2	The Contractor shall immediately provide the Authority with any updates of this schedule, the active personnel list and their contact information.
TS-02 Requirement #5.1.4-3	The Contractor shall notify the Authority within twenty-four (24) hours whenever a critical update or patch is released by the manufacturer of COTS software used in the Toll System.

The Contractor shall develop the criteria for critical updates and patches subject to the Authority's approval and document same prior to the Midpoint Design Review Milestone. |
TS-02 Requirement #5.1.4-4	For repeated failure of equipment, components, software or other System elements, the Contractor shall undertake an investigation and report the results of such investigation to the Authority. Such report shall detail the anticipated failure rate and actual field results; describe research into the cause; attribute cause; and detail the required remediation.
TS-02 Requirement #5.1.4-5	The Contractor shall evaluate maintenance reports and other maintenance related data for any indication of a pervasive defect in the Toll System. The Contractor shall notify the Authority of all such indications within one (1) week of each one's respective discovery.
TS-02 Requirement #5.1.4-6	The Contractor shall prepare and submit a report to the Authority weekly detailing all updates and patches released during the prior week by each manufacturer of COTS software used in the Toll System.

Contract Criteria	
TS-02 Requirement #5.1.4-7	The Contractor shall prepare and submit an updated maintenance report to the Authority weekly. Each such updated report shall provide a complete outline of all tasks and activities required for the successful maintenance of the Toll System. At a minimum, said report shall: • Provide a complete statement of the Toll System's status through performance measure reporting • Indicate progress made on operational, project or task issues or activities during the reporting period including but not limited to progress made on work to correct deficiencies, the status of activities to be undertaken in the next reporting period, activities/tasks behind schedule and identification of problems/concerns related to the services, statistics on problems encountered/resolved in the reporting period and year-to-date • Provide statistics on performance, diagnostics, reliability, availability and serviceability of each element of the Toll System and compare these to the Authority's requirements for these attributes as stated in each said element's respective Tolling Specification document.
TS-02 Requirement #5.1.4-8	The Contractor shall prepare and submit an updated Key Performance Indicator report to the Authority with each monthly invoice for O&M Work. The summaries of each such report shall only include data from the period coinciding with the invoiced services.
TS-02 Requirement #5.1.4-9	The Contractor shall prepare and submit a COTS software report to the Authority no less frequently than once every ninety (90) days. This report shall detail: • The type and status of license for each COTS software element including but not limited to license expiration date (if any) and the dates when manufacturer support will change or end • All patches or other changes to each COTS software element released by its respective manufacturer. • The date where each such patch or change was applied to the Toll System
TS-02 Requirement #5.1.4-10	The Contractor shall prepare and submit a Toll System documentation report to the Authority no less frequently than once every ninety (90) days. This report shall detail the current version and publication date of the: • Bill of Materials • System Design Document (SDD) • Detailed Test Procedures document • System Administrator Manual • Supervisor Manual • User Manual • System Maintenance Manual
TS-02 Requirement #5.1.4-11	The Contractor shall prepare and submit a Toll System security audit report to the Authority no less frequently than once every ninety (90) days. This report shall list the security audits required by section 5.1.5 below and provide the status of each.

5.1.5. Security

Contract Criteria	
TS-02 Requirement #5.1.5-1	The Contractor shall ensure that all confidentiality requirements specified in the Contract are adhered to by all people on the Contractor's team.
TS-02 Requirement #5.1.5-2	The Contractor shall conduct comprehensive security audits of the Toll System on both a scheduled and ad hoc basis as described in the Security section of the Management Plan.
TS-02 Requirement #5.1.5-3	User access controls and all other security measures in place at the successful completion of Project Acceptance Test shall remain in operation and any changes of any kind shall be subject to the Authority's written approval.
TS-02 Requirement #5.1.5-4	The Contractor shall not circumvent any security related process or procedure approved by the Authority.
TS-02 Requirement #5.1.5-5	The Contractor shall ensure that all security requirements specified in the Security section of the Management Plan and elsewhere in the Contract are adhered to by all people on the Contractor's team.
TS-02 Requirement #5.1.5-6	Annually, between the months of January and June, the Contractor shall successfully complete an audit of the Statement on Standards for Attestation Engagements (SSAE) No. 16 and the International Standards for Assurance Engagements (ISAE) No. 3402 and provide the respective report(s) to the Authority without redaction.

As detailed in the Contract, the Authority reserves the right to:

- Have any Contractor employee or subcontractor personnel removed from working on the Contract at any time and for any reason

- Conduct additional background checks on any Contractor employee and subcontractor personnel at any time at the Authority's own expense

- Conduct additional security audits at any time at the Authority's own expense

5.2. Monitoring

Contract Criteria	
TS-02 Requirement #5.2-1	The Contractor shall monitor Toll System status; check for Toll System anomalies, faults and failures; and respond to Toll System alarms on a 24/7 basis.
TS-02 Requirement #5.2-2	The Contractor shall receive and process Authority telephone calls regarding Toll System anomalies, faults and failures on a 24/7 basis.
TS-02 Requirement #5.2-3	The Contractor shall receive and process Authority e-mails regarding Toll System anomalies, faults and failures on a 24/7 basis.
TS-02 Requirement #5.2-4	The Contractor shall log and store the time and form of notification for all Toll System anomalies, faults and failures using the Toll System's MOMS function. Where more than one notification of a single anomaly, fault and failure occurs, the Contractor shall log and store each accordingly.
TS-02 Requirement #5.2-5	For each fault or failure, the earliest of the following events shall be used for calculating Availability (described in section 6.1 below): • The time at which any associated anomaly, status change or alarm is first logged by the Toll System • The time of the Authority's first phone call to the Contractor regarding such fault or failure • The time at which the Contractor's systems first store the Authority's e-mail notification of such fault or failure

5.3. Toll System Tuning and Certification

Contract Criteria	
TS-02 Requirement #5.3-1	No AVI reader, cabling or antenna changes by the Contractor are allowed at any time after successful completion of Revenue Service Acceptance Test without the Authority's written approval, which shall not be unreasonably withheld.
TS-02 Requirement #5.3-2	The Contractor shall maintain the tuning of all Automatic Vehicle Identification elements to operate in accordance with all E-ZPass Group performance requirements. This requirement applies to all AVI readers regardless of whether they were re-used or furnished new.
TS-02 Requirement #5.3-3	The Contractor shall certify to the Authority no less frequently than once every twenty-four (24) months that such AVI tuning has been maintained.

Key Performance Indicators related to this work are detailed in Appendix A of this TS-02 document.

5.4. Software Escrow

The Contractor shall be responsible for software escrow as described in the Contract terms and conditions.   Per the TS-01 document, the Contractor's software escrow responsibilities begin prior to successful completion of the Installation Ready Design Review Milestone.

Contract Criteria	
TS-02 Requirement #5.4-1	The Contractor shall deposit an additional complete set of all Toll System software source code with the software escrow agent immediately after making any fix, patch or update to the Toll System software.
TS-02 Requirement #5.4-2	The Contractor shall furnish the following to the Authority immediately upon making each such software escrow deposit. • A comprehensive listing of all configurable parameters in all Toll System software including but not limited to the escrowed software and all COTS software • The then-current setting of each configurable parameter at all Toll System locations • Detailed instructions for compiling, installing, configuring and setting parameters of all Toll System software (including but not limited to the escrowed software and all COTS software) so as to fully replace all toll system software from the copy retained by the escrow agent
TS-02 Requirement #5.4-3	The Contractor shall update the software escrow such that it is always at the level of completeness necessary to successfully compile all versions and variations of the Toll System installed at the Authority's facilities.
TS-02 Requirement #5.4-4	The Contractor shall provide updated software build instructions to the Authority each time updated software is deposited with the escrow agent.
TS-02 Requirement #5.4-5	The Contractor shall provide updated software validation procedures to the Authority each time updated software is deposited with the escrow agent.
TS-02 Requirement #5.4-6	The Contractor shall update the software escrow no less frequently than once every three (3) months.
TS-02 Requirement #5.4-7	The Contractor shall store the latest six (6) complete sets of all Toll System software with the escrow agent.
TS-02 Requirement #5.4-8	The Contractor shall notify the Authority at least sixty (60) days prior to deleting or allowing the software escrow agent to delete any other software sets and the Authority shall have the sole option of continuing the storage of these sets with the escrow agent as Extra Work (described in Tolling Specification #02).

The set of source code referenced above is fully defined by the Contract.

5.5. Documentation Updates

Contract Criteria	
TS-02 Requirement #5.5-1	The Contractor shall update all of the following Toll System plan documents no less frequently than once every twelve (12) months: • Quality Plan • Security Plan • Configuration & Change Management Plan • Test Plan • Training Plan
TS-02 Requirement #5.5-2	The Contractor shall update all of the following Toll System training materials no less frequently than once every twelve (12) months: • Instructor Guide • Training Aids • Student Workbook • Other training materials
TS-02 Requirement #5.5-3	The Contractor shall update all of the following Toll System design documents no less frequently than once every twelve (12) months: • Bill Of Materials • System Design Document (SDD) • Detailed Test Procedures document
TS-02 Requirement #5.5-4	The Contractor shall update all of the following Toll System manuals no less frequently than once every twelve (12) months: • System Administrator Manual • Supervisor Manual • User Manual • System Maintenance Manual
TS-02 Requirement #5.5-5	All updates of the documents above shall meet the requirements stated in Tolling Specification #01 and be no less comprehensive than the version approved by the Authority for successful completion of the 100% Design Review Milestone.
TS-02 Requirement #5.5-6	The Contractor shall furnish all updates of the documents above in the electronic format and media prescribed by Tolling Specification #01. The Authority will review and comment on each document update provided by the Contractor. The Authority requires a minimum of twenty-one (21) calendar days to review each such updated document.
TS-02 Requirement #5.5-7	The Contractor shall maintain a delivery, comment and response tracking log to facilitate monitoring the progress of all document updates. Such tracking log shall take the form of a spreadsheet or database and clearly delineate the changed content and status thereof for all documents.

Contract Criteria	
TS-02 Requirement #5.5-8	The Contractor shall incorporate all Authority comments received on updated documents. The Contractor shall provide as many iterations as are necessary for the Authority to declare each updated document as "approved-in-principle".

Tolling Specification #01 details the required content for the documents above. Key Performance Indicators related to this work are detailed in Appendix A of this TS-02 document.

5.6. Training

Contract Criteria	
TS-02 Requirement #5.6-1	The Contractor shall provide all training for the Contractor's employees, suppliers and subcontractors at no additional charge to the Authority.

The Contractor shall provide additional sessions of the training courses for Authority personnel (described in the TS-01 document) at any time after successful completion of the Project Acceptance Test milestone. The Authority will request all such additional sessions in writing and all such additional sessions are considered Extra Work (see section 9 below).

5.7. Maintenance Of Traffic

Contract Criteria	
TS-02 Requirement #5.7-1	The Contractor shall provide all labor, materials and equipment for Maintenance Of Traffic.
TS-02 Requirement #5.7-2	The Contractor shall only use Maintenance Of Traffic materials and equipment in accordance with the design documentation signed and sealed by the Engineer Of Record.
TS-02 Requirement #5.7-3	The Contractor shall retain the services of the Engineer Of Record (specified in Tolling Specification #01) to develop, sign and seal all updates of the Maintenance Of Traffic plans and specifications required for Toll System maintenance.
TS-02 Requirement #5.7-4	This Engineer Of Record and the Maintenance Of Traffic services provider shall be familiar with the roadways and traffic conditions at the Authority's facilities and in the surrounding areas.
TS-02 Requirement #5.7-5	After the Toll System at an ORT zone has successfully completed Revenue Service Acceptance Test, the Contractor shall limit all partial or full closures of such zone to the times specified in Appendix B of this TS-02 document.
TS-02 Requirement #5.7-6	After the Toll System at a traditional lane has successfully completed Revenue Service Acceptance Test, the Contractor shall limit all closures of such lane to the times specified in Appendix B of this TS-02 document.

Contract Criteria	
TS-02 Requirement #5.7-7	After the Toll System at a traditional lane has successfully completed Revenue Service Acceptance Test, the Contractor shall limit all closures of such lane and any adjacent lane (i.e. two lane closures) to the times specified in Appendix B of this TS-02 document.

6. MAINTENANCE WORK

The following requirements may be met through any combination of direct on-site work hours, on-call availability and remote access that the Contractor deems most suitable.

Proposal Criteria
The Offeror shall include in their proposal a summary of no more than three (3) page-sides detailing their Toll System maintenance methodology. This summary shall address how this methodology will be implemented within the Offeror's firm and all subcontractors, suppliers, and/or other firms involved in this project and include a table identifying those reference projects where this same methodology was implemented and used by the Offeror and their associated subcontractors and suppliers.
The Offeror shall detail their planned staffing levels for all maintenance work described here in section 6 and all its subsections by providing job titles, number of full-time equivalent positions in each job title, normal working hours of each job title and the anticipated split of their work on-site at the Authority's facilities and remotely. Anticipated job titles include but are not limited to: - Operations & Maintenance Manager   - Monitoring personnel (as described in section 5.2 above)   - Software maintenance personnel   - Field work personnel
The Offeror shall describe the anticipated frequency and duration of: - All traditional lane, partial ORT Zone and full ORT Zone closures required each month to perform scheduled maintenance activities   - All Host Subsystem outages required each year to perform scheduled maintenance activities

Contract Criteria	
TS-02 Requirement #6-1	The Contractor shall maintain the Toll System on a 24/7 basis.
TS-02 Requirement #6-2	The Contractor shall conduct Maintenance of Traffic in accordance with the current Virginia Work Area Protection Manual and ensure that all Contractor personnel on-site for operations and maintenance work activities are appropriately trained and certified.
TS-02 Requirement #6-3	The Contractor shall perform all work necessary to correct Toll System anomalies, faults and failures affecting Toll System function, performance and availability.

Contract Criteria	
TS-02 Requirement #6-4	The Contractor shall log and store the time and form of notification; the time and form of acknowledgement; and the response and repair times for all such work using the Toll System's MOMS function.

6.1. System Availability

System availability is the percentage of time that all functions of the respective subsystem are operating without any degradation in performance. For purposes of calculating this percentage:

- The time spent performing scheduled maintenance activities (as described in the Management Plan) is excluded from all parts of this calculation. For the remaining calculation period:

    o The time at which an anomaly, fault or failure occurs is described in section 5.2 above and this shall be considered the start time of the Toll System outage or performance degradation

    o Extended repair times caused by Maintenance Of Traffic restrictions (see section 5.7 above) shall count as an extended Toll System outage or performance degradation

    o Restoration occurs when all Toll System elements (affected by the anomaly, fault or failure) return to operation with all function and without any degradation in performance

Contract Criteria	
TS-02 Requirement #6.1-1	The Contractor shall provide all corrective, preventive and predictive maintenance necessary to provide Availability of 99.8% or better for the Host Subsystem.
TS-02 Requirement #6.1-2	The Contractor shall provide all corrective, preventive and predictive maintenance necessary to provide Availability of 99.8% or better for each travel lane at each ORT Zone Subsystem location.
TS-02 Requirement #6.1-3	The Contractor shall provide all corrective, preventive and predictive maintenance necessary to provide Availability of 99.8% or better for all elements of each toll lane at each Traditional Lane Subsystem location. Response and repair time for any outage caused by a 3rd party placing debris in an automatic coin machine, up to the corresponding limit in section 6.2 below, will be omitted from this Availability calculation.

Key Performance Indicators related to availability are detailed in Appendix A of this TS-02 document.

6.2. ACM Debris Cleanout

Contract Criteria	
TS-02 Requirement #6.2-1	For any fault or failure resulting from a 3rd party feeding debris into the ACM at the Forest Hill ramps, Powhite Plaza and DTE Plaza; the Contractor shall respond and restore the respective lane to full performance within two (2) hours when the fault or failure first occurs between 5:00 a.m. and 7:00 p.m.
TS-02 Requirement #6.2-2	For any fault or failure resulting from a 3rd party feeding debris into the ACM at the Douglasdale ramps, 2nd Street ramps, 11th Street ramps and the Boulevard Bridge; the Contractor shall respond and restore the respective lane to full performance within four (4) hours when the fault or failure first occurs between 5:00 a.m. and 7:00 p.m.
TS-02 Requirement #6.2-3	The Contractor shall respond and restore the respective lane to full performance within six (6) hours at all other times.

Key Performance Indicators for ACM debris clean out response and repair time are detailed in Appendix A of this TS-02 document.

6.3. Preventive Maintenance

Contract Criteria	
TS-02 Requirement #6.3-1	The Contractor shall periodically inspect all Toll System elements including but not limited to fans, equipment racks, cabinets, enclosures, alignments, environmental control units, filters and batteries.
TS-02 Requirement #6.3-2	The Contractor shall periodically inspect all Enclosures and ensure that cable access holes, and other required openings remain properly sealed.
TS-02 Requirement #6.3-3	The Contractor shall perform preventive maintenance on the Toll System hardware, data processing units and software. The Contractor shall make such repairs, adjustments and replacements of elements as may be necessary to maintain the Toll System in normal operating condition and achieve availability.
TS-02 Requirement #6.3-4	The Contractor shall check computers and other data processing elements periodically in accordance with the Maintenance section of the Management Plan to verify that storage space is not reaching limits, disks are not fragmented or damaged, software being used is of latest version and patch level and data is being processed and transferred in an appropriate manner.

6.4. Toll System Licenses

Contract Criteria	
TS-02 Requirement #6.4-1	The Contractor shall furnish and apply all COTS software license renewals necessary to allow normal operation of the Toll System.

Key Performance Indicators related to this work are detailed in Appendix A of this TS-02 document.

6.5. Toll System Updates

Contract Criteria	
TS-02 Requirement #6.5-1	The Contractor shall provide all Toll System changes necessary to maintain secure and reliable operation of the Toll System. Such changes include but are not limited to parameter changes, software upgrades, software replacement, equipment rework and equipment replacement.
TS-02 Requirement #6.5-2	The Contractor shall furnish and apply all COTS software patches and updates to the Toll System. Critical and security related changes shall be applied within thirty (30) calendar days of release by the software's manufacturer. All Other shall be applied within sixty (60) calendar days of release by the software's manufacturer.
TS-02 Requirement #6.5-3	The Contractor shall furnish and apply all COTS equipment firmware patches and updates to the Toll System within thirty (30) calendar days of release by the manufacturer. Critical and security related changes shall be applied within thirty (30) calendar days of release by the software's manufacturer. All Other shall be applied within sixty (60) calendar days of release by the software's manufacturer.
TS-02 Requirement #6.5-4	In the event that patches or updates for any operating system, network, database, middleware or other COTS software are no longer available from the software's manufacturer, the Contractor shall immediately: • Furnish and install replacement COTS software having similar functional capabilities, capacity and quality in the Authority's sole determination • Furnish and install any equipment and other software related to the replacement COTS software • Update all documentation to reflect the replacement COTS software • Conduct all testing necessary to test the replacement COTS software and other Toll System changes, if any, to the Authority's satisfaction
TS-02 Requirement #6.5-5	The Contractor shall immediately design and test changes to the Toll System in accordance with the Detailed Test Procedures document (described in Tolling Specification #01) whenever any Toll System Equipment item is no longer manufactured. The resulting alternate Equipment and software shall be equal to or better than that proposed by the Contractor, at the sole determination of the Authority.

Contract Criteria	
TS-02 Requirement #6.5-6	The Contractor shall immediately design and test changes to the Toll System in accordance with the Detailed Test Procedures document (described in Tolling Specification #01) whenever any Toll System Equipment item is no longer sold by an authorized distributer of the manufacturer for use at the Authority's facilities. The resulting alternate Equipment and software shall be equal to or better than that proposed by the Contractor, at the sole determination of the Authority.
TS-02 Requirement #6.5-7	The Contractor shall provide all Toll System changes necessary to maintain Toll System function and performance.

Key Performance Indicators related to this work are detailed in Appendix A of this TS-02 document.

6.6. Pervasive Defect Resolution

Contract Criteria	
TS-02 Requirement #6.6-1	If any problem is determined by the Authority to be a pervasive defect, the Contractor shall replace and repair the problem equipment or software at no additional charge to the Authority.

7. EXTENDED PARTS & LABOR WARRANTY

As described in the Contract terms and conditions:

- A full parts and labor warranty remains in force through successful completion of the Project Acceptance Test and is part of the (fixed lump sum) Capital Project amount.

- This full parts and labor warranty extends and remains in force throughout the Operations and Maintenance Contract initial period and all of its renewals. This "extended warranty" is part of the (fixed monthly) O&M Work amounts.

Contract Criteria	
TS-02 Requirement #7-1	The Contractor shall procure, ship, stock, secure, furnish and install all Toll System elements used to repair Toll System performance degradation and failures caused by manufacturing defect; installation method; and the age of the component.

Contract Criteria	
TS-02 Requirement #7-2	The Contractor shall procure, ship, stock, secure, furnish and install all Toll System elements used to repair Toll System performance degradation and failures caused by normal wear including but not limited to: - Debris fed into the Automatic Coin Machines by motorists and others, both accidentally and intentionally - Power surges - Other power defects
TS-02 Requirement #7-3	The Contractor shall procure, ship, stock, secure, furnish and install all Toll System elements used to repair Toll System performance degradation and failures resulting from the Contractor's gross negligence including but not limited to failure to secure the toll equipment cabinet door and shipping parts in inappropriate packaging.
TS-02 Requirement #7-4	The Contractor shall procure, ship, stock, secure, furnish and install all Toll System elements used to repair Toll System performance degradation and failures resulting from any environmental event including but not limited to damage due to sunlight, temperature, precipitation, wind and lightning. All such repairs are considered normal monthly maintenance and do not quality as Force Majeure under the Contract.

8. EXTRA WORK PARTS INVENTORY

Contract Criteria	
TS-02 Requirement #8-1	The Contractor shall procure, store, secure and manage a separate additional inventory of parts for Extra Work other than System Confirmation (see section 9 below).
TS-02 Requirement #8-2	The Contractor shall replace any and all parts in such additional inventory that, due factors beyond the Authority's control, become obsolete. Such factors include but are not limited to Contractor design changes. The Authority will not reimburse the Contractor for any scrapping or rework of this additional inventory resulting from factors beyond the Authority's control.

As detailed in the Contract terms and conditions:

- The Authority will purchase this additional inventory of parts for Extra Work

- The Authority will determine all replacement quantities and reimburse the Contractor for replacing this additional inventory when it is used for Extra Work

9. EXTRA WORK

9.1. General

Contract Criteria	
TS-02 Requirement #9-1	Upon receiving a written authorization from the Authority for Extra Work, the Contractor shall immediately provide all parts and labor necessary to repair or replace any Toll System element damaged by the Authority or a 3rd party. Such damage may include: • Motor vehicle accidents • Vandalism excluding the wear described in section 7 above
TS-02 Requirement #9-2	All Extra Work involving Toll System equipment, conduit and cabling shall be performed in accordance with Tolling Specification #03.
TS-02 Requirement #9-3	Upon receiving a written authorization from the Authority for Extra Work, the Contractor shall provide additional sessions of the training courses (described in Tolling Specification #01) for Authority personnel.
TS-02 Requirement #9-4	Upon receiving a written authorization from the Authority for Extra Work, the Contractor shall assist the Authority in transitioning the operations & maintenance work described in this document to a new provider.

9.2. System Confirmation

Contract Criteria	
TS-02 Requirement #9.2-1	Within sixty (60) days of any request by the Authority to do so, the Contractor shall successfully complete all testing required to verify that proper tuning of all Automatic Vehicle Identification elements is being maintained and shall successfully complete all Project Acceptance Test activities as described in the Detailed Test Procedures document (see Tolling Specification #01). Monitoring of Toll System accuracy, performance, reliability and auditability in live traffic shall occur for at least thirty (30) days for these activities. All work for each such request, including but not limited to the testing and any efforts to address deficiencies identified during performance of the test, are the responsibility of the contractor and are cumulatively referred to as a System Confirmation. The price for successful completion of each System Confirmation is a lump-sum amount and is specified by the Contract.

10. KPI SCORING

The Contractor shall furnish and install the Toll System and provide services that meet all requirements specified in the Tolling Specification documents (i.e. TS-01 through TS-06). The Authority intends to use a scorecard approach to focus on a small set of Key Performance Indicators (KPIs) that are regularly tracked, monitored and reported to assess Contractor performance against the Authority's O&M Work requirements. Calculation and reporting of KPIs, associated non-compliance points, scores and price adjustments are detailed in the Contract terms and conditions.

The Contractor shall use best efforts to minimize the impacts that result from failure to meet the KPIs, regardless of whether invoice adjustments are made. Furthermore, the Contractor shall take corrective action to immediately remedy any failures and provide a Corrective Action Plan (CAP) to the Authority documenting the corrective action taken to prevent future reoccurrence of the problem associated with the non-compliance.

A summary of the KPIs and their associated non-compliance points is provided in a scorecard format as Appendix A of this TS-02 document. Details on how these may reduce the amount invoiced by the Contractor for O&M Work are described in the Contract terms and condition.

TS-02: APPENDIX A

KEY PERFORMANCE INDICATORS and
NON-COMPLIANCE POINTS

KPI #	Focus Area	Compliance Level	Non-compliance point formula (un-escalated)	Monthly Report Calculation			
				Non-compliance points this month (un-escalated)	Consecutive months non-compliant (1, 2, 3 or > 3)	Escalation multiplier (1, 2 or 4)	Score
1	**Operations:** Software licenses	As specified in TS-02 Requirement #6.4-1	__ points for non-compliance				
2	**Operations:** Updates	As specified in section 6.5 of the TS-02 document.	__ points for each day that each update is late				
3a	**Accuracy:** Record creation	One and only one electronic record[1] per vehicle is produced for 99.95% of all vehicles passing through a traditional lane.	__ points for each 0.01% or portion thereof below the compliance level for each lane				
3b	**Accuracy:** Record creation	One and only one electronic record[1] per vehicle is produced for 99.95% of all vehicles passing through an ORT zone anywhere on the travel lanes or shoulders.	__ points for each 0.01% or portion thereof below the compliance level for each zone				

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[1] i.e. an ACM Transaction, a Manual ISF Transaction, an ID Card Transaction, a Non-Revenue Transaction, an E-ZPass Transaction; or an Image Transaction (as further described in the TS-04 document)

KPI #	Focus Area	Compliance Level	Non-compliance point formula (un-escalated)	Monthly Report Calculation			
				Non-compliance points this month (un-escalated)	Consecutive months non-compliant (1, 2, 3 or > 3)	Escalation multiplier (1, 2 or 4)	Score
4	**Accuracy:** Record data	99.5% of all electronic records[1] accurately and completely describe such vehicle, transponder (if any) and payment at the toll point.	__ points for each 0.1% or portion thereof below the compliance level for each lane				
5	**Accuracy:** Image quality	0.2% of images are rejected for reasons under the Contractor's control.	__ points for each 0.1% or portion thereof above the compliance level				
6a	**Latency:** Full replacement transponder status files from CSC	As specified in TS-04 Requirement ##3.1.1-1	__ points for each non-compliant file				
6b	**Latency:** Incremental transponder status updates from CSC	As specified in TS-04 Requirement #3.1.1-2	__ points for each non-compliant update				
7	**Latency:** Transaction files to CSC	As specified in TS-04 Requirement #3.6.1-5	__ points for each 0.1% below the compliance level				

KPI #	Focus Area	Compliance Level	Non-compliance point formula (un-escalated)	Monthly Report Calculation			
				Non-compliance points this month (un-escalated)	Consecutive months non-compliant (1, 2, 3 or > 3)	Escalation multiplier (1, 2 or 4)	Score
8	**Latency:** Image files to CSC	As specified in TS-05 Requirement #3.3.3-1 and TS-06 Requirement #3.5.2-4	__ points for each 0.1% or portion thereof below the compliance level				
9	**Availability:** Host Subsystem	As specified in TS-02 Requirement #6.1-1	__ points for each 0.1% or portion thereof below the compliance level				
10	**Availability:** ORT Zone Subsystem	As specified in TS-02 Requirement #6.1-2	__ points for each 0.1% or portion thereof below the compliance level for each lane __ additional points for every 5 minutes of any (full or partial) zone closure occurring during peak hours				

KPI #	Focus Area	Compliance Level	Non-compliance point formula (un-escalated)	Monthly Report Calculation			
				Non-compliance points this month (un-escalated)	Consecutive months non-compliant (1, 2, 3 or > 3)	Escalation multiplier (1, 2 or 4)	Score
11	**Availability:** Traditional Lane Subsystem	As specified in TS-02 Requirement #6.1-3	__ points for each 0.1% or portion thereof below the compliance level for each lane __ additional points for every 5 minutes of lane closure occurring during peak hours				
12	**Availability:** ACM debris at higher revenue locations	As specified in TS-02 Requirement #6.2-1 for the Forest Hill ramps, Powhite mainline Plaza and DTE mainline Plaza)	__ points for each hour or portion thereof above the compliance level for each incident				
13	**Availability:** ACM debris at other locations	As specified in TS-02 Requirement #6.2-2 for the Douglasdale ramps, 2nd Street ramps, 11th Street ramps and the Boulevard Bridge)	__ points for each hour or portion thereof that the average time for all incidents exceeds the compliance level.				

Total non-compliance points (with escalation) from KPIs #1 through #13

TS-02: APPENDIX B

LANE/ZONE CLOSURES

GENERAL

All Maintenance of Traffic (MOT) operations shall be conducted in accordance with the current versions of the Manual on Uniform Traffic Control Devices (MUTCD), the Virginia Work Area Protection Manual (WAPM), and subject to the approval of the Authority, VDOT, City of Richmond, and the RMTA. The Engineer Of Record shall prepare and submit a Maintenance of Traffic (MOT) Plan for review and approval by the Authority for each phase of construction. The Engineer Of Record's signing and MOT plan shall consider the efforts of adjacent contractors, motorists and any pedestrian traffic adjacent or below the work area.

The Contractor shall provide the Authority no less than 7 calendar days notice before closing any Traditional (toll) Lane or any ORT Zone. Approval to close any Traditional Lane or any ORT Zone is subject to review and consideration of event traffic in the vicinity.

No work or installation of any MOT devices may commence unless the work can be completed and the area reopened to traffic within the allowable lane closure hours, AND the Contractor has a contingency plan approved by the Authority. No less than (7) calendar days prior to beginning the work, the Contractor shall submit a contingency plan to the Authority for approval. This plan shall detail temporary protective measures to allow for restoration of the road for use when the Contractor is unable to complete a repair due to unusual circumstances beyond his control. Temporary protective measures shall only be used in emergency situations and are not allowed to remain in place for an extended period of time without authorization by the Authority.

The Contractor shall be aware that no traffic control devices (such as Group II channeling devices, cones, Arrow Boards, etc.), with the exception of advance warning signs shall be placed on any median, roadway or shoulder prior to the time shown. Advance warning signs may be placed not more than thirty (30) minutes prior to the begin time herein. All traffic control devices including advance warning signs shall be removed, the roadway free of debris, and the lane open to traffic by the end time herein.

The Contractor shall be aware that failure to comply with the times set forth herein may result in liquidated damages.

Prior to setting any lane or shoulder closures, the Contractor shall meet with the Authority to review MOT for each of the lane closures the Contractor intends to perform. The Engineer Of Record shall prepare a sketch identifying the signs to be used and their respective locations. Sketches shall be prepared in accordance with the current version of the WAPM. The Contractor shall coordinate these meetings with the Authority, so that the RMTA has no less than (7) days after the meeting ends, to advise the motoring public of upcoming traffic restrictions. Maintenance and installation of all lane closures shall be the sole responsibility of the Contractor.

HOLIDAYS AND SPECIAL EVENTS

The project will be officially shut down for the following holidays during the periods noted:

- Memorial Day: 5/26/17 (Friday) – Noon through
                       5/30/17 (Tuesday) – 10:00 A.M.

- Independence Day: 6/30/17 (Friday) – Noon through
                       7/5/17 (Wednesday) – 10:00 A.M.

- Labor Day: 9/1/17 (Friday) - Noon through
                       9/5/17 (Tuesday) - 10:00 A.M.

- Thanksgiving: 11/22/17 (Wednesday) - Noon through
                       11/27/17 (Monday) - 10:00 A.M.

- Christmas: 12/22/17 (Friday) - Noon through
                       12/26/17 (Tuesday) - 10:00 A.M.

- New Year: 12/29/17 (Friday) - Noon through
                       01/02/18 (Tuesday) - 10:00 A.M.

- Easter: 03/30/18 (Friday) - Noon through
                       04/03/18 (Tuesday) - 10:00 A.M.

   (Future Holidays will follow this format until project completion)

The Authority reserves the right to limit/cancel/modify the lane closure times and/or work that may be performed to accommodate the following special events. The Contractor should be aware of typical increased weekend traffic during these events.

- Any NASCAR Race in Richmond (Typically 2 per year, in April and September)

- Ukrop's Monument Ave. 10K Race (Typically the second weekend in April)

- Dominion River Rock (Weekend in middle of May)

- Slide the City (Typically a Saturday in June)

- Jazz Festival at Maymont Park (Typically a weekend in August).

- Richmond Folk Festival (Weekend in the Middle of October)

- Richmond Marathon (Weekend in the Middle of November)

The Contractor shall prepare and submit a Maintenance of Traffic (MOT) Plan for review and approval by the Authority (7) days in advance for any lane closure during a special event. No allowance shall be made for these periods in determining the contract end date.

ORT ZONES
- If a full ORT Zone closure is required, the Contractor, the Authority and the Engineer shall schedule a mutually agreeable time. The length of the full closure shall be minimized by the Contractor.
- Single ORT lane closures with in an ORT zone will follow the guidance for the corresponding mainline toll plaza single lane closure.

POWHITE PARKWAY (MAINLINE TOLL PLAZA) TRADITIONAL LANES
- There shall be at least three toll lanes open in a single direction at all times.
- One (l) Full Service lane in each direction must remain open at all times.
- No NB Toll Lane shall be closed from 5:00 a.m. to 10:00 a.m.
- No SB Toll Lane shall be closed from 3:00 p.m. to 7:00 p.m.
- Lane 3 and Lane 12 (Secure Booths) may not be closed between 11:00 p.m. to 7:00 a.m. any day
- Times of allowable single lane closures:
  - Northbound:
    - Weekdays – 10:00 a.m. to 5:00 a.m.
    - Weekends – 10:00 a.m. Friday – 5:00 a.m. Monday
  - Southbound:
    - Weekdays – 6:00 a.m. to 3:00 p.m. & 7:00 p.m. to 6:00 a.m.
    - Weekends – 7:00 p.m. Friday – 3:00 p.m. Monday
- Times of allowable multiple lane closures:
  - Northbound:
    - Weekdays – 9:00 p.m. to 5:00 a.m.
    - Weekends – RMTA shall decide allowable times based on individual weekend request by Contractor
  - Southbound:
    - Weekdays – 9:00 p.m. to 6:00 a.m.
    - Weekends – RMTA shall decide allowable times based on individual

FOREST HILL (RAMP TOLL PLAZAS)
- One (l) Full Service lane for each ramp must remain open at all times.
- The Forest Hill Off Ramp (Lanes, 16, 18, 20 and 22) shall follow the times specified for Southbound Powhite Parkway (Mainline Toll Plaza) Traditional Lanes.
- The Forest Hill On Ramp (Lanes, 15 and 17) shall follow the times specified for Northbound Powhite Parkway (Mainline Toll Plaza) Traditional Lanes.
- The Forest Hill On Ramp (Lanes, 19 and 21) shall follow the times specified for Northbound Powhite Parkway (Mainline Toll Plaza) Traditional Lanes.

DOUGLASDALE RAMPS
- The Douglasdale Off Ramp (Lane 25) shall follow the times specified for Southbound Powhite Parkway (Mainline Toll Plaza) Traditional Lanes.
- The Douglasdale On Ramp (Lane 23) shall follow the times specified for Northbound Powhite Parkway (Mainline Toll Plaza) Traditional Lanes.
- A detour must be provided when the ramp is closed

BOULEVARD BRIDGE
- One (l) Full Service lane in each direction must remain open at all times.
- The Northbound plaza lanes shall follow the times specified for Northbound Powhite Parkway (Mainline Toll Plaza) Traditional Lanes.
- The Southbound plaza lanes shall follow the times specified for Southbound Powhite Parkway (Mainline Toll Plaza) Traditional Lanes.

DOWNTOWN EXPRESSWAY (MAINLINE TOLL PLAZA)
- There shall be at least six toll lanes open EB at all times.
- There shall be at least six toll lanes open WB at all times.
- One (l) Full Service lane in each direction must remain open at all times.
- Times of allowable single lane closures:
  - Eastbound:
    - Weekdays – 10:00 a.m. to 6:00 a.m.
    - Weekends – 10:00 a.m. Friday – 6:00 a.m. Monday
  - Westbound:
    - Weekdays – 6:00 a.m. to 3:00 p.m. & 7:00 p.m. to 6:00 a.m.
    - Weekends – 7:00 p.m. Friday – 3:00 p.m. Monday
- Times of allowable multiple lane closures:
  - Eastbound:
    - Weekdays – 7:00 p.m. to 6:00 a.m.
    - Weekends – RMTA shall decide allowable times based on individual weekend request by Contractor
  - Westbound:
    - Weekdays – 9:00 p.m. to 6:00 a.m.
    - Weekends – RMTA shall decide allowable times based on individual weekend request by Contractor

11th STREET RAMPS
- One (l) lane at each ramp must remain open at all times.
- The Off Ramp shall follow the times specified for Westbound Downtown Expressway (Mainline Toll Plaza) Traditional Lanes.
- The On Ramp shall follow the times specified for Eastbound Downtown Expressway (Mainline Toll Plaza) Traditional Lanes.

2nd STREET RAMPS
- The Off Ramp shall follow the times specified for Westbound Downtown Expressway (Mainline Toll Plaza) Traditional Lanes.
- The On Ramp shall follow the times specified for Eastbound Downtown Expressway (Mainline Toll Plaza) Traditional Lanes.
- A detour must be provided when the ramp is closed

POINT OF CONTACT

The Contractor must have a point of contact or construction foreman responsible for the entire project <u>on site</u> at all times. This person will coordinate all work and shall be in close contact with the onsite inspections and shall clearly communicate any changes to the work plan, if they occur. In the event that this individual changes from the previous day, the Contractor shall contact the Authority and confirm this change, prior to starting any work. The Contractor will be required to have a point of contact on duty at all times, regardless of extended shifts or type(s) of work being performed.

The Contractor shall provide written notice to the Authority a minimum of 7 calendar days notice before any lane or ramp closures. The Authority reserve the right to restrict dates and times of proposed lane or ramp closures. Contractor shall not be permitted to close any ramps or lanes during events in Downtown Richmond or the vicinity when high traffic volumes are expected to enter or exit Downtown.

All lane closures must be coordinated with VDOT, City of Richmond (if applicable) and the Authority for final approval of dates and times. It will be the Authority's sole responsibility to notify VDOT Traffic Operations Center (Smart Traffic) at 804-796-4520 to advise of the lane closure status of these Traditional Lanes and ORT Zones. The Contractor shall communicate any changes in these times/dates immediately with the Authority.

LANE CLOSURE AND MOT VIOLATIONS

The RMTA reserves the right to charge liquidated damages for the Contractor's failure to remove a lane or ramp closure by the prescribed time each day. The liquidated damages shall be established as One Thousand Dollars ($1,000) per each fifteen (15) minutes, or a portion of 15 minutes, per lane or ramp, for any closure beyond the limits established above. Assessment of liquidated damages will stop when all maintenance of traffic devices are removed from the roadway and lanes or ramps have been safely reopened to the approval of the Authority. Any liquidated damages assessed in this Special Provision will be in addition to those listed in Section 108 of the Specifications.

Active work shall be pursued by the Contractor within one (1) hour from the time a lane or ramp closure is placed. The RMTA reserves the right to charge liquidated damages, as stated above, after one (1) hour of non-active work from the time the lane or ramp closure placement is completed. If active work has not started within two (2) hours from the time that the lane closure placement is completed, the Authority shall require the lane closure to be immediately removed. Assessment of liquidated damages will end when lanes or ramps have been safely reopened to the approval of the Authority or active work is pursued. Active work will be on-site activity as determined by the Authority.

In addition, active work must be on-going at all times while a closure is in place. If active work is stopped for one (1) hour while a closure is in place or a closure is not removed within one (1) hour of the completion of active work, the Authority reserves the right to charge liquidated damages as stated above. The Contractor shall be aware that he will be required to perform active work while the deck is curing and shall have a minimum of two vehicles in the lane closure with high-intensity rotating, oscillating, or strobe lights flashing at all times.

STAGING AREA / CONSTRUCTION ENTRANCE

The Contractor shall be aware of the close proximity of live traffic to the work zone. Extra care shall be taken when slow moving vehicles are entering live traffic. The Engineer Of Record must demonstrate how vehicles can enter and exit the work zone safely and minimize impacts to general public in the Maintenance Of Traffic design.

CERTIFICATION OF PERSONNEL

FHWA regulations provided in 23 CFR Subpart J state "States shall require that personnel involved in the development, design, implementation, operation, inspection, and enforcement of work zone related transportation management and traffic control be trained, appropriate to the job decisions each individual is required to make." In accordance with the FHWA regulation and VDOT regulations, the Contractors foreman, or employee who is directly responsible for placing maintenance of traffic devices, shall be properly trained. The minimum training required for this Contract is the "Basic Work Zone Traffic Control Training" course. This is a one-day course designed by VDOT. For more information on the course, see the following website: http://www.vdot.virginia.gov/business/trafficeng-WZS.asp

A trained employee must be on-site prior to setting up traffic control devices or a stop work order may be issued. In addition, a trained employee must be on-site at all times when any work inside a work zone requiring traffic control is on-going. A trained employee must be on-site at all times during the removal of traffic control devices. This employee will coordinate with the "Point of Contact" at all times. If the inspector or engineer observes the Contractor without a trained employee

on-site during the setting up, maintenance or removal of the work zone traffic control, the RMTA reserves the right to charge liquidated damages at the rate of One Thousand Dollars ($1,000) per day.

RESTRICTED TIME OF WORK AREAS

Portions of the Downtown Expressway, Beltline Expressway Connectors, and the Powhite Parkway are adjacent to residential areas. These areas are identified as, but not limited to, the neighborhoods near the intersection of Powhite Parkway and Forest Hill Avenue and neighborhoods between the Downtown Expressway Beltline Connector and Park Drive/Blanton Avenue on the north end of the project.

Work in these areas after 11:00 PM shall be restricted. Activities permitted after this time shall include saw-cutting, placement of concrete, and asphalt paving. Any activities that produce unacceptable decibel levels, as determined by the Authority, shall not be permitted. Typical activities not permitted after 11:00 PM include, but are not limited to, jack hammering or roto-hammering.

PROTECTION OF PROPERTY

The Contractor shall provide for the Authority's review the method intended to protect the motoring public, from any activity which poses a potential threat to another's property or person (i.e. cars, motorcycles, pedestrians, businesses, etc.). This includes debris from jack-hammering and hydro-demolition activities. The Contractor shall provide protective measures for Authority personnel to travel between plaza buildings and toll booths near any area of work.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Maintenance of Traffic shall be measured and paid for on a lump sum basis for each of the three (3) ORT Zones and for each of the six (6) groupings of Traditional Lanes stated in TS-06 Appendix A.

The bid price will be considered full compensation for all required MOT setups for all activities (lane closures and detours) including, but not limited to: field surveys, removal work, System installation work, System testing work, System tuning and certification work, and System operations and maintenance work, detour routes, highway flaggers, and advance signing and preparation of all MOT submittals and resubmittals to the Authority and VDOT for approval. The Contractor shall also include in the lump sum bid price all permits, including Work in Streets permits, required by the City of Richmond necessary to perform all MOT work.

All MOT plans and requests for lane closures on VDOT highways must be prepared and submitted in a format acceptable to VDOT which may include providing plans and narratives that are prepared by the Engineer Of Record.

Additionally the lump sum bid price shall include all equipment, light pods, materials, labor and equipment required to install and maintain MOT setups for the duration specified in this Special Provision.

TS-03

Tolling Specification #03: Hardware and Installation

TOLLING SPECIFICATION #03: HARDWARE AND INSTALLATION

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1. ACRONYMS & KEY TERMS

Acronyms and key terms are defined in the TS-01 document.

2. EXISTING CONDITIONS

2.1. Infrastructure

Contract Criteria	
TS-03 Requirement #2.1-1	The Contractor shall conduct detailed field surveys to assess the condition and suitability of conduits, pull boxes, work boxes, gantries, power distribution, pavement and all other items provided by others at the installation locations.
TS-03 Requirement #2.1-2	If conduits, pull boxes, work boxes, gantries, power distribution, pavement or any other item provided by the others is inadequate to support the Contractor's Toll System design, the Contractor shall: • Have the Engineer Of Record design any modification of this infrastructure necessary for successful operation of the Toll System and said design shall be subject to the Authority's approval • Furnish and construct such approved modifications (without additional charge to the Authority)

2.2. Existing Toll System

The TS-04, TS-05 and TS-06 documents identify specified existing toll system elements whose re-use is allowable but not required.

Contract Criteria	
TS-03 Requirement #2.2-1	Where re-use of an existing toll system element (e.g. equipment, cabling, conduit, mounting hardware, enclosure, etc.) is specifically allowed, the Contractor shall make any and all field surveys and measurements at the installation locations necessary to assess all requirements and ramifications of its re-use.
TS-03 Requirement #2.2-2	If re-use of an existing toll system element is not specifically allowed, or if the Contractor determines that re-use is not appropriate, the Contractor shall remove and properly dispose of all such items in accordance with all federal, state and local statutes.

2.3. Electromagnetic Profile

There is and will continue to be active electrical equipment installed and operational throughout the Authority's facilities. Such equipment includes but is not limited to the toll system currently installed at the Authority, police two-way radios, mobile telephones, security equipment, HVAC equipment and roadway lighting.

Contract Criteria	
TS-03 Requirement #2.3-1	The Contractor shall make any field surveys and measurements at the installation locations that may be necessary to fully understand and characterize the electromagnetic properties and constraints at each work site prior to the Midpoint Design Review Submittal (described in the TS-01 document).

Toll System requirements for electromagnetic interference and electromagnetic susceptibility are detailed in section 5 below.

The Authority will remain responsible for all FCC license application renewal activities related to the Toll System.

3. NETWORK

The communications jacks that serve as network demarcation points between the Toll System elements at various locations and the Authority's wide area network are detailed in Appendix A of this TS-03 document. The Authority will provision and operate the wide area network interconnecting these jacks.

Additional communications jacks will be provisioned to serve as network demarcation points between the Toll System and the VDOT E-ZPass Customer Service Center as described in the TS-04, TS-05 and TS-06 documents. Others will provision and operate the links between these jacks and the VDOT E-ZPass Customer Service Center.

Toll System requirements related to these networks are specified in the TS-04, TS-05 and TS-06 documents.

4. POWER

The existing power panels that will serve as the other Toll System power demarcation points are described in the TS-04, TS-05 and TS-06 documents. The Authority will operate the utility feeder system supplying power to these panels; however, the Authority makes no guarantees as to the availability, conditioning or other quality measure of such power.

	Proposal Criteria
As part of their proposal, the Offeror shall detail and quantify the anticipated Toll System power requirements at each location where the Toll System will be installed.	

Contract Criteria	
TS-03 Requirement #4-1	The Contractor shall provide all uninterruptible power supplies, line conditioning, protection devices and other power equipment required for the protection, operation and maintenance of the Toll System during: • Switch-over by others between various utilities and substations • Emergency generator start up and switch-over (by others) including any period while such generator is coming up to speed • Restoration of utility power and the switch-back (by others) from this local generator power
TS-03 Requirement #4-2	All circuit breakers furnished and installed by the Contractor shall have a minimum interrupt rating of 10,000 Amps.
TS-03 Requirement #4-3	All Toll System elements shall be protected against over current, over voltage, under voltage and lightning on all of their inputs and outputs. This requirement applies to all circuits including but not limited to those routed in underground runs and those routed overhead.
TS-03 Requirement #4-4	Fuses shall not be used as protection devices. All protection elements shall: • Have equal performance for bipolar operation with an automatic reset feature and a minimum life of 1000 surges • Be UL, ETL or FM listed • Be automatic and self-restoring • Be on duty at all times
TS-03 Requirement #4-5	All circuits shall be designed or selected assuming a maximum of 25 ohms to ground.
TS-03 Requirement #4-6	Each power outlet furnished and installed by the Contractor shall be NEMA 5 20R, GFCI, 1 pole, 3 wire grounding type, rated for 20A at 125V unless otherwise specified. Each such power outlet shall be wired using #12AWG or larger conductors connected to a 20A circuit breaker provided with sufficient power.

5. GENERAL REQUIREMENTS

The Authority prefers hardware and software in the following categories from the manufacturers identified below:

- Network equipment: Cisco Systems
- Server hardware: No brand or model preference
- Operating System: No brand or product line preference
- Applications: All files shall be compatible with Microsoft Office 2007
- Anti-virus software: No brand or product line preference
- Database software: No brand or product line preference
- Ad hoc report software: As described in the TS-04 document

Contract Criteria	
TS-03 Requirement #5-1	All equipment and other materials furnished by the Contractor shall be new, be field proven and meet applicable ISO, IEEE and ANSI standards. The Contractor shall not furnish any item to the Authority that has been previously used for development work, a part of a previously purchased system or any items that have been salvaged or rebuilt.
TS-03 Requirement #5-2	All equipment and other hardware furnished by the Contractor shall have a service life of at least five (5) years after successful completion of the respective Revenue Service Acceptance Test.
TS-03 Requirement #5-3	All equipment furnished by the Contractor shall have multiple sources readily available to the Authority.
TS-03 Requirement #5-4	Other than COTS electronic assemblies, all steel hardware furnished by the Contractor shall be galvanized in accordance with the VDOT Road and Bridge Specifications (see Appendix C of this TS-03 document).
TS-03 Requirement #5-5	All elements of the Toll System installed and in operation shall remain undamaged and continue to provide full function, performance, reliability and availability when subjected to: a) Shock of 5 g for 10 ±1 millisecond in any of three mutually perpendicular axes b) Vibration of 1 g at 15 Hz in any of three mutually perpendicular axes
TS-03 Requirement #5-6	All elements of the Toll System shall be designed for seismic forces (Fp) in accordance with the BOCA National Building Code section 1610. An effective "Peak Velocity-related Acceleration Coefficient" (Av) of 0.15 or greater shall be used in all calculations.
TS-03 Requirement #5-7	All Toll System elements shall be Federal Communication Commission (FCC) licensed and approved.

Contract Criteria	
TS-03 Requirement #5-8	All elements of the Toll System shall not interfere with other equipment present in the Authority's facilities at the completion of the Revenue Service Acceptance Test including but not limited to police two-way radios, citizens' band radios, other radio systems allowed or licensed by the FCC, mobile telephones, security equipment, roadside lighting and other electrically powered items.
TS-03 Requirement #5-9	All elements of the Toll System shall not be susceptible to electromagnetic emissions from other equipment present in the Authority's facilities at the completion of the Revenue Service Acceptance Test including but not limited to police two-way radios, citizens' band radios, other radio systems allowed or licensed by the FCC, mobile telephones, security equipment, roadside lighting and other electrically powered items.
TS-03 Requirement #5-10	All elements of the Toll System shall be properly grounded to ensure the safety of all Authority staff and Contractor personnel.

6. ENVIRONMENTAL CONDITIONS

Contract Criteria	
TS-03 Requirement #6-1	The Toll System shall meet all performance, reliability and availability requirements when concurrently exposed to the environmental factors described in subsections 6.1 through 6.3 below and other environmental factors including but not limited to sunlight; precipitation and moisture; wind; vibration; car, truck and bus emissions; industrial exhausts; industrial cleaners; road salt; gasoline; and vehicle lubricants.

6.1. Host Subsystem Locations

Contract Criteria	
TS-03 Requirement #6.1-1	All elements of the Toll System installed in the server room of the Powhite Plaza South administration building shall meet all performance and reliability requirements when operated inside their closed/locked enclosures under the following conditions: **Temperature:** 32 to 120 degrees Fahrenheit **Relative Humidity:** 5 to 95 percent, noncondensing

6.2. ORT Zone Subsystem Locations

Contract Criteria	
TS-03 Requirement #6.2-1	All elements of the ORT Zone Subsystem shall meet all performance and reliability requirements when operated inside their locked/closed enclosures under the following conditions: • **Temperature:** Ambient air temperature of minus 25 to 140 degrees Fahrenheit, with and without direct sunlight • **Relative Humidity:** 5 to 100 percent • **Salt Fog:** Salt atmosphere with 5 percent salinity

6.3. Traditional Lane Subsystem

Contract Criteria	
TS-03 Requirement #6.3-1	Receipt Printers (described in the TS-06 document) shall meet all performance and reliability requirements when operated under the following ambient conditions: • **Temperature:** 32 to 120 degrees Fahrenheit • **Relative Humidity:** 5 to 95 percent • **Salt Fog:** Salt atmosphere with 5 percent salinity
TS-03 Requirement #6.3-2	All other elements of the Traditional Lane Subsystem in all toll plaza booths, tunnels and canopies; all basement areas of the toll plaza buildings; and all exterior locations exposed to weather shall meet all performance and reliability requirements when operated inside their closed/locked enclosures under the following ambient conditions: • **Temperature:** Ambient air temperature of minus 25 to 140 degrees Fahrenheit, with and without direct sunlight • **Relative Humidity:** 5 to 100 percent • **Salt Fog:** Salt atmosphere with 5 percent salinity

TS-03 Requirement #6.3-3	All elements of the Traditional Lane Subsystem in air conditioned areas of the toll plaza buildings other than toll plaza booths, tunnels, mezzanines and canopies shall meet all performance requirements specified when operated inside their closed/locked enclosures under the following ambient conditions:
	
	 • **Temperature:** Elements installed in:
	     o Heated areas shall meet performance requirements for temperatures between 32 and 120 degrees Fahrenheit
	     o Unheated areas shall meet performance requirements for temperatures between zero and 120 degrees Fahrenheit
	 • **Relative Humidity:** 5 to 95 percent, noncondensing

7. EQUIPMENT

	Proposal Criteria
As part of their proposal, the Offeror shall provide a detailed listing of any and all non-COTS equipment proposed and a statement on the purpose of each said equipment item.	

Contract Criteria	
TS-03 Requirement #7-1	All equipment shall be selected by the Contractor such that anyone can readily obtain a sufficient quantity of new equipment spare parts to replace damaged equipment and all end of-life equipment failures during the five (5) year period following successful completion of the Revenue Service Acceptance Test.
TS-03 Requirement #7-2	All Toll System elements shall have a second source of manufacture.
TS-03 Requirement #7-3	All Toll System equipment shall consist of modular field replaceable units to allow for easy and quick maintenance.
TS-03 Requirement #7-4	All Toll System elements performing the same function shall be interchangeable.
TS-03 Requirement #7-5	All Toll System elements shall use ISO standard input/output interface modules in all serial, discrete and interface boards and in all computers.
TS-03 Requirement #7-6	All Toll System elements shall have at minimum two spare slots to support the addition of elements at each location where slots are used for all computers furnished by the Contractor.
TS-03 Requirement #7-7	All Toll System equipment chassis, attachments and hardware shall be fabricated from corrosion and rust resistant materials.
TS-03 Requirement #7-8	All Toll System equipment furnished by the Contractor shall have grounding pads or grounding lugs.
TS-03 Requirement #7-9	Other than sensors installed in pavement, all Toll System equipment shall be mounted in enclosures as defined in subsection 7.2 below.
TS-03 Requirement #7-10	All Toll System equipment shall have surge suppression on all external power and signal lines and the associated ground wire length shall not exceed four feet.
TS-03 Requirement #7-11	All Toll System equipment shall gracefully and automatically shut down whenever the climate inside of its enclosure exceeds the temperature, humidity or other environmental parameters specified by its respective manufacturer.

7.1. UPS

Each Toll System uninterruptible power supply element (UPS) shall operate connected to panel boards that transfer power from the various electrical utility companies and substations servicing the Authority and the Authority's own local generators. Switchover between these power sources is automatically controlled and provided by others upstream of each such panel board.

Contract Criteria	
TS-03 Requirement #7.1-1	All Toll System UPSs shall provide continuous use and operate across the full range of environmental criteria described in section 6 above.
TS-03 Requirement #7.1-2	All Toll System UPSs shall have sealed, valve regulated, lead acid or nickel cadmium, maintenance-free batteries with a rated life expectancy of 10 years, to provide the specified running time for the maximum loads anticipated at the unit.
TS-03 Requirement #7.1-3	All Toll System UPSs shall provide the following features: • Pure sine wave-power output, less than 5% Total Harmonic Distortion. The output voltage shall be regulated to 3% and meet the standards set by ANSI C84.1 • Brownout protection • Lightning and surge protection, meeting ANSI/IEEE C62.41 Categories A and Temperature-compensated charger • Automatic battery replacement warning, inverter check, runtime monitoring and shutdown • Isolation of output neutral, meeting requirements for true, separately derived power source as defined by the National Electric Code Article 250-5d • Rated for switch-mode power supplies
TS-03 Requirement #7.1-4	All Toll System UPSs shall provide and operate with appropriate filtering circuits to maintain the power quality levels described above during: • Switch-over by others between various utilities and substations • Emergency generator start up and switch-over by others and the period while the generator is coming up to speed • Restoration of utility power and its being switched back in by others to supplant local generator power
TS-03 Requirement #7.1-5	Each Toll System UPS shall sustain, for a minimum of one (1) hour, without utility or generator power, the full load of all equipment connected to it at the time of the Revenue Service Acceptance Test plus spare capacity for similar future loads equaling an additional 50% of said load amount.
TS-03 Requirement #7.1-6	The Toll System shall monitor each such UPS and transmit information to the Host Subsystem's MOMS function including but not limited to: • Condition of UPS batteries • Power line conditions • Alarm messages generated by the UPS

Contract Criteria	
TS-03 Requirement #7.1-7	The Toll System shall cause the Host Subsystem's MOMS function to log and issue an alert when: • Any such UPS transitions to or from battery power • Any Toll System element has been automatically shut down based on UPS battery levels
TS-03 Requirement #7.1-8	No existing UPS elements shall be re-used as part of the Contract.

7.2. Enclosures

Proposal Criteria
As part of their proposal, the Offeror shall provide a detailed listing of any and all non-COTS enclosures and associated hardware proposed and a statement on the purpose of each.

Contract Criteria	
TS-03 Requirement #7.2-1	The Contractor shall furnish and install enclosures for all Toll System equipment.
TS-03 Requirement #7.2-2	The Contractor shall furnish and install each Touch Screen Display, Receipt Printer and Magnetic Stripe Card Reader in the standard enclosure provided by its manufacturer.
TS-03 Requirement #7.2-3	The Contractor shall furnish and install a commercial quality computer rack(s) suitable for housing all Host Subsystem equipment, where each such rack has a top cover; covers on both sides; a hinged and locked front cover; a hinged and locked rear cover; power distribution; and an appropriately sized air moving device(s).
TS-03 Requirement #7.2-4	The Contractor shall furnish and install equipment enclosures with a NEMA 13 rating or better for all other Toll System equipment located in air conditioned areas of the toll plaza buildings other than toll plaza booths, tunnels, mezzanines and canopies.
TS-03 Requirement #7.2-5	For all other Toll System equipment, the Contractor shall furnish and install equipment enclosures constructed using unpainted sheet stainless steel with a minimum thickness of 0.125 inch and compliant with the NEMA 3R standard or better.
TS-03 Requirement #7.2-6	All equipment enclosures furnished by the Contractor shall have a drain installed in the bottom of the box and said drain shall be of a type that maintains the rating of the enclosure.
TS-03 Requirement #7.2-7	All equipment enclosures furnished by the Contractor shall have tamper switches and sensors integrated such that the Host Subsystem logs, stores and issues MOMS alerts for all access.

Contract Criteria	
TS-03 Requirement #7.2-8	All equipment enclosures furnished by the Contractor shall have temperature and humidity monitoring sensors integrated and calibrated such that the Host Subsystem logs, stores and issues a MOMS alert whenever any Toll System element exceeds the temperature or humidity limits specified by its manufacturer.
TS-03 Requirement #7.2-9	The Toll System shall provide screens and tools for temperature and humidity threshold values to be configured by an Authority user(s) for each enclosure housing different types or quantities of equipment.
TS-03 Requirement #7.2-10	All enclosures containing a Lane Controller or a Zone Controller shall cause the Host Subsystem MOMS function to generate, log and transmit an alert whenever the climate inside the enclosure reaches such temperature or humidity threshold value.
TS-03 Requirement #7.2-11	All enclosures containing a Lane Controller or a Zone Controller shall contain a master "on/off" switch that shuts off all power within such enclosure for maintenance purposes. Said switch shall be clearly and permanently labeled with the "on" and "off" positions indicated. A circuit breaker may be utilized for such switch.
TS-03 Requirement #7.2-12	All enclosures containing a Lane Controller or a Zone Controller shall contain at least one unused power outlet for use as a convenience outlet. For the purpose of power load calculations, the Engineer Of Record may assume that said outlet will not be used for a specific or dedicated load.
TS-03 Requirement #7.2-13	All equipment enclosures furnished by the Contractor shall have a locking cover to prevent unauthorized access. All said locks shall: • Be removable and replaceable cylinder lock types or similar as approved by Authority • Have different keys from any other enclosures furnished by the Contractor within a seventy-five (75) mile radius of Richmond, Virginia
TS-03 Requirement #7.2-14	All equipment enclosures of the same type shall be furnished by the Contractor with identical enclosure locks that open with the same key number. The key for an enclosure of one equipment type shall not open the enclosure of a different equipment type.
TS-03 Requirement #7.2-15	All enclosures furnished by the Contractor shall have moisture tight hubs for all conduit entrances.
TS-03 Requirement #7.2-16	Conduit (see section 8 below) shall only enter an enclosure through the bottom or side of the enclosure. Top conduit entries shall not be used.
TS-03 Requirement #7.2-17	Conduit entering an enclosure from the side shall only enter the enclosure below the equipment mounted within.
TS-03 Requirement #7.2-18	All enclosures furnished by the Contractor shall have adequate space to add 25% more elements by volume in a future expansion of the Toll System.
TS-03	All racks furnished by the Contractor shall have adequate space to add 25% more

Contract Criteria	
Requirement #7.2-19	elements in a future expansion of the Toll System.
TS-03 Requirement #7.2-20	All enclosures furnished by the Contractor shall have a machine generated schematic mounted in plain sight and showing all connections between all enclosed Toll System elements.
TS-03 Requirement #7.2-21	All enclosures furnished by the Contractor shall have a list of all adjustment settings made to any equipment contained therein and copies of all associated Shop Drawings including but not limited to wiring diagrams. Said documentation shall be stored in a watertight plastic pouch and placed on the inside of the access door or similar appurtenance.
TS-03 Requirement #7.2-22	All enclosures and panel boards furnished by the Contractor shall have an engraved plastic nameplate clearly showing the same unique name as used on all Detailed Design Drawings for the enclosure or panel board.
TS-03 Requirement #7.2-23	All panel boards furnished by the Contractor shall have a typed schedule of circuits mounted in plain sight within the panel board.

8. CONDUIT

Contract Criteria	
TS-03 Requirement #8-1	The Contractor shall furnish and install all conduit, couplings, pull boxes and junction boxes for all Toll System cabling (see section 9 below).
TS-03 Requirement #8-2	The Contractor shall furnish and install a single type of conduit over any run. Conduit types shall not be mixed and all conduit lengths, couplings, bodies and fittings over any run shall be manufactured from the same materials and of identical construction type.
TS-03 Requirement #8-3	Conduit connections to equipment that may be subject to movement or vibration or equipment with mounting that requires field adjustment shall be made with Liquid-Tight Flexible Steel Conduit (LSC), provided: • LSC shall be installed to permit maximum flexibility without crushing or permanent deformation • LSC installations shall not exceed 18 inches in length
TS-03 Requirement #8-4	All LSC shall be low smoke, Zero-Halogen, polyurethane outer jacket type.
TS-03 Requirement #8-5	All other conduit furnished and installed by the Contractor shall be polyethylene (PE) type SDR 11 conforming to ASTM D 3035 standards.
TS-03 Requirement #8-6	Where meeting existing conduit of a different type, only conduit couplings specifically listed (by their manufacturer) for transition between the two conduit types shall be used.

Contract Criteria	
TS-03 Requirement #8-7	All conduit elements for power connections shall be separate and distinct from conduit elements for signal/communications connections.
TS-03 Requirement #8-8	The Contractor shall make all commercially reasonable accommodations for aesthetics wherever conduits are installed in finished interior spaces or next to roadways or other outdoor spaces visible to the public. The Authority reserves the right to require the Contractor to remove, re-design and re-install solely at its own expense any conduit installed by the Contractor that the Authority considers to be aesthetically unacceptable, provided such unacceptable attribute(s) is not shown on the Detailed Design Drawings.
TS-03 Requirement #8-9	Wherever possible, conduits shall be concealed or routed to have a minimal visual impact. All conduits shall be run concealed behind ceiling or wall finishes where such finishes exist.
TS-03 Requirement #8-10	The Contractor shall furnish and install a pull string in each empty conduit furnished and installed by the Contractor.

9. CABLING

Contract Criteria	
TS-03 Requirement #9-1	The Contractor shall furnish and install all cabling necessary for the protection of personnel and the successful protection, operation and maintenance of the Toll System.
TS-03 Requirement #9-2	All cabling shall conform to UL requirements and all power cabling for: • Indoor locations shall be type "XHHW-IT' rated for 600V • Outdoors and underground locations shall be type "RHH/RHW/USF" (triple rated) rated for 600V
TS-03 Requirement #9-3	Cabling for power circuits shall be made with conductors sized #12AWG or larger. The minimum sized ground shall be #12 AWG.
TS-03 Requirement #9-4	The Contractor shall provide cable tags on both ends for all power cabling.
TS-03 Requirement #9-5	Cabling for general-purpose control and instrumentation shall be: • 'THWN' or better for indoor locations only • 'THHW' or better for outdoor or wet locations
TS-03 Requirement #9-6	All fiber optic cabling furnished and installed by the Contractor shall contain at least 50% additional good, unused fibers at the time of successful completion of the Revenue Service Acceptance Test.

Contract Criteria	
TS-03 Requirement #9-7	The Contractor shall provide cable tags on both ends for all general-purpose control and instrumentation cabling.
TS-03 Requirement #9-8	The Contractor shall run all cabling in conduit except where specified otherwise by the Authority.
TS-03 Requirement #9-9	All cabling and its connectors shall be labeled and strain relief shall be provided to protect the conductors or fiber optic fibers.
TS-03 Requirement #9-10	All field wiring shall be terminated on screw lugs or connectors. All connectors shall be keyed or polarized to prevent incorrect connections.
TS-03 Requirement #9-11	The Contractor shall dress all equipment cables in a consistent manner and be neatly done to facilitate future maintenance activities including as a minimum: • All cabling shall be enclosed in a cable raceway, conduit, enclosure or under a raised floor if the location has a raised floor • Data cabling and power cabling shall be in separate raceways or conduits (not combined in the same raceway) • Cabling shall not obstruct any personnel pathways around installed equipment or create a trip hazard of any kind • All cabling shall be installed in a neat and orderly fashion with service loops provided • All cabling shall be properly, securely terminated and all cable connectors shall be of a type that will withstand the vibration levels generated by vehicle traffic passing through the toll facility

10. MOUNTING HARDWARE

Contract Criteria	
TS-03 Requirement #10-1	All mounting hardware shall be fabricated from corrosion and rust resistant materials. Galvanizing shall be applied as described in section 5 above.
TS-03 Requirement #10-2	All right angle beam clamps applied to vertical beams and all straps applied to horizontal channel/unistrut shall only be installed with a positive mechanical means of preventing their slippage or other movement due to shock and vibration.
TS-03 Requirement #10-3	All fastening hardware shall have lock washers and elastic stop nuts in addition to regular nuts.

Contract Criteria	
TS-03 Requirement #10-4	All mounting hardware shall comply with all requirements in this and other Tolling Specifications. All mounting hardware supporting Toll System equipment shall also comply with all requirements of the manufacturers of all Toll System equipment to which it is directly or indirectly attached.

11. MAINTENANCE OF TRAFFIC

The Engineer Of Record shall design all Maintenance Of Traffic (MOT) for all on-site installation, testing, tuning and maintenance of the Toll System as detailed in the TS-01 document.

Contract Criteria	
TS-03 Requirement #11-1	The Contractor shall not close any toll plaza lane or any ORT zone, in whole or in part, other than during those days and hours listed in Appendix B of the TS-02 document.
TS-03 Requirement #11-2	The Contractor shall conduct Maintenance of Traffic in accordance with the current Virginia Work Area Protection Manual and ensure that all Contractor personnel on-site for installation and related activities are appropriately trained and certified.
TS-03 Requirement #11-3	Prior to successful completion of the associated Revenue Service Acceptance Test, the Contractor shall request Authority permission for all traditional toll lane closures and all ORT zone closures at least seven (7) days prior to each respective closing.
TS-03 Requirement #11-4	The Contractor shall perform all lane closures, zone closures and other MOT work in accordance with the Detailed Design Drawings signed and sealed by the Engineer Of Record.
TS-03 Requirement #11-5	The Contractor shall provide all Maintenance Of Traffic (MOT) materials, equipment and personnel for installation, tuning and testing of the Toll System.
TS-03 Requirement #11-6	The Contractor shall have the Engineer Of Record oversee all set up, operation and removal of signage and other materials, equipment and personnel for MOT during Toll System installation, tuning and testing.

12. INSTALLATION

Harris Electric served as the electrical contractor for the existing toll system in the traditional lanes and at the DTE ORT zone and they currently serve as the Authority's on-call electrician.

Epitome Networks has worked on the Authority's wide area network and currently serves as the Authority's on-call network support staff.

	Proposal Criteria
The Offeror shall include copies of the electrician licenses in their proposal.	
As part of their proposal, the Offeror shall describe their lighting and power requirements during their on-site installation, tuning and testing work and how they plan to satisfy these requirements.	

Contract Criteria	
TS-03 Requirement #12-1	The Contractor shall perform all electrical work using electricians appropriately licensed by the Commonwealth of Virginia.
TS-03 Requirement #12-2	The Authority will only authorize the Contractor to begin installation on-site at the Authority's facilities after completion of the Factory Acceptance Test Milestone, as detailed in Tolling Specification #01.
TS-03 Requirement #12-3	Before shutdown or discontinuation of service on any circuit, system or feeder, the Contractor shall coordinate the related on-site work activities with the Authority to minimize shutdown periods. The Contractor shall coordinate the shutdown or discontinuation with the Authority a minimum of seven (7) days prior to when such shutdown or discontinuation is needed.
TS-03 Requirement #12-4	The Contractor shall at all times maintain the integrity of all other circuits in service that may be affected by the on-site work.
TS-03 Requirement #12-5	The Authority will solely determine both the sequence of traditional lane toll plazas and ORT Zones where the Contractor may perform installation work. The Authority will also determine the maximum number of plazas and zones where the Contractor may perform installation work concurrently.
TS-03 Requirement #12-6	The Contractor shall limit their removal and installation work such that no more than one (1) traditional lane in the same travel direction of any plaza or ramp location is out of service during peak hours.

Unless otherwise approved by the Authority in writing, all Contractor work in that toll lane and all Revenue Service Acceptance Test activities for that toll lane shall be successfully completed before the Contractor can work on the next toll lane serving the same travel direction. |

Contract Criteria	
TS-03 Requirement #12-7	The Contractor shall supply all personnel, tools, materials and equipment required to safely perform all work at the Authority's facilities. This requirement extends to all materials and supplies required for the complete installation of each subsystem including but not limited to: • All equipment and vehicles required for overhead installation work on gantries • All specialty equipment for preparation and saw-cutting of loops as required • All testing resources, as further detailed in Tolling Specification #01
TS-03 Requirement #12-8	All required devices and tools shall have adequate and up-to-date security software and be approved by the Authority before they are used on the Toll System network or the Authority's wide area network.
TS-03 Requirement #12-9	All on-site work performed by the Contractor shall be sequenced as described in the installation section of the Management Plan (described in Tolling Specification #01) and the Detailed Design Drawings, Detailed Contract Specifications and Shop Drawings (described in Tolling Specification #01).
TS-03 Requirement #12-10	The Contractor shall immediately enter or update all details of each Toll System element into the MOMS function of the Host Subsystem after installing such element.
TS-03 Requirement #12-11	The Contractor shall make all ground connections to metallic cold water piping system at locations readily available for inspection. Where such piping is not available, the Contractor shall use other available electrodes or make electrodes as described in NEC sections 250-81 or 250-83. The Contractor shall install ground rods such that they are connected to grounding electrode conductors using exothermic welds. All ground rods shall be 3/4", 10' long copper and provide a maximum of twenty-five (25) ohms resistance to ground. No grounding conductor shall be smaller in size than 12 AWG unless it is a part of an acceptable cable assembly.
TS-03 Requirement #12-12	The Contractor shall validate all cabling terminations, whether furnished by the Contractor or re-used, via a test process to ensure that the cabling is connected to the correct location on each end and that the cabling is properly terminated.
TS-03 Requirement #12-13	The Contractor shall furnish all required grounding material and clean all ground connections immediately prior to connection.
TS-03 Requirement #12-14	The Contractor shall bond all metallic manhole frames, metallic junction boxes and other conductive items to the grounding system in conformance with the NEC.
TS-03 Requirement #12-15	The Contractor shall furnish and install a separate insulated ground conductor in all raceways that contain power conductors. Grounding conductor size shall be as required by all local and national codes. Minimum ground wire size shall be #12 AWG. Conduits or other raceways shall not be utilized as a ground conductor, even where permitted by local or national codes.

Contract Criteria	
TS-03 Requirement #12-16	The Engineer Of Record shall oversee all installation related work at the Authority's facilities and the Contractor shall make all on-site work accessible to the Authority at any time in order to allow the Authority to review the work.
TS-03 Requirement #12-17	The Contractor shall provide all temporary lighting needed during on-site installation, tuning and testing of the Toll System in accordance with the Detailed Design Drawings.
TS-03 Requirement #12-18	The Engineer Of Record shall oversee the set-up, operation, temporary removal and permanent removal of all temporary lighting required during on-site installation, tuning and testing of the Toll System.
TS-03 Requirement #12-19	The Contractor shall perform cutting, drilling and core boring only where shown in the Detailed Design Drawings approved by the Authority when the installation of conduit requires penetration through structure walls, floors or slabs.
TS-03 Requirement #12-20	For all conduit penetrating walls and floors, the Contractor shall install a galvanized steel sleeve with wall or floor supports, as required. After installation, the Contractor shall seal and make all such penetrations fire, smoke and water tight around the sleeve.
TS-03 Requirement #12-21	The Contractor shall patch and restore all resulting openings to the original condition of the adjacent construction. The fire rating of all patched wall and floor penetrations shall match the original wall or floor.
TS-03 Requirement #12-22	Prior to connecting the Toll System to a network demarcation point, the Contractor shall apply to the COTS software all new versions, patches and fixes released by the respective manufacturer and identified in the Installation-Ready Design Review submittal (as approved in principle by the Authority).
TS-03 Requirement #12-23	The Contractor shall provide the Authority with a copy of the completed installation checklist attested to by the (Contractor's) Project Manager immediately after installation is completed at each ORT zone and traditional lane.

13. INFRASTRUCTURE DOCUMENTATION

Contract Criteria	
TS-03 Requirement #13-1	The Detailed Design Drawings shall show and specifically call out each item of existing toll equipment, cabling, conduit and mounting hardware and describe whether it is to be removed or (where allowable) abandoned in place or re-used.
TS-03 Requirement #13-2	The Detailed Design Drawings shall show all Toll System elements furnished and installed by the Contractor.
TS-03 Requirement #13-3	The Shop Drawings shall detail all enclosures, conduit, cabling and mounting hardware assembled off-site.

Contract Criteria	
TS-03 Requirement #13-4	All Detailed Design Drawings, Detailed Design Specifications, Detailed Design Calculations and Shop Drawings (described in the TS-01 document); all other shop work; and all field work shall conform to the latest edition of all codes, standards and specifications listed below which would be applicable if the Authority were a private organization: a) American Association of State Highway Traffic Officials (AASHTO) Standard: Specifications for Structural Support of Highway Signs, Luminaries and Traffic Signals b) American Association of State Highway Traffic Officials (AASHTO) Standard: Specifications Bridge Welding Code c) Code of Federal Regulations (CFR), including but not limited to 1926.62-Lead d) Federal Highway Administration (FHWA), including but not limited to the Manual on Uniform Traffic Control Devices
TS-03 Requirement #13-5	All Detailed Design Drawings, Detailed Design Specifications, Detailed Design Calculations and Shop Drawings; all other shop work; and all field work shall conform to the latest edition of the "Road and Bridge Specifications" of the Virginia Department Of Transportation (see Appendix C of this TS-03 document).
TS-03 Requirement #13-6	All Detailed Design Drawings, Detailed Design Specifications, Detailed Design Calculations and Shop Drawings; all other shop work; and all field work shall conform to the latest edition of all codes, standards and specifications listed below which would be applicable if the Authority were a private organization: a) Environmental Protection Agency (EPA) a) Occupational Safety and Health Act (OSHA), all requirements, including but not limited to the Lead in Construction Standard, 29 CFR 1926.62 and 29 CFR 1910.146

Contract Criteria	

TS-03 Requirement #13-7	All Detailed Design Drawings, Detailed Design Specifications, Detailed Design Calculations and Shop Drawings; all other shop work; and all field work shall conform to the latest edition of all codes, standards and specifications listed below which would be applicable if the Authority were a private organization.
	
	   a) American National Standards Institute (ANSI)
	   b) Institute of Electrical and Electronics Engineers (IEEE)
	   c) National Electrical Safety Code (ANSI/IEEE C2)
	   d) National Fire Protection Association:
	      • NFPA-70, also known as the National Electrical Code or NEC®
	      • NFPA-502: Recommended Practice on Fire Protection for Limited Access Highways, Tunnels, Bridges, Elevated Roadways and Air Right Structures
	      • NFPA-780: Standard for Installation of Lightning Protection Systems
	   e) Building Officials and Code Administrators, Inc. (BOCA)
	   f) Electrical Testing Laboratories (ETL)
	   g) Illuminating Engineers Society (IES)
	   h) National Electrical Manufacturers Association (NEMA)
	   i) Underwriters Laboratories, Inc. (UL)
	   j) National Electrical Contractors Associations - National Electrical Installation Standards

TS-03 Requirement #13-8	The Detailed Design Drawings shall detail all items described in sections 7 through 11 above.

TS-03: APPENDIX A

WAN DEMARCATION POINTS

Richmond
Metropolitan Authority
WAN Topology

HQ

Powhite

DTE

I-Net

Cable
{DMVPN}

MPLS

2nd Street

Multi -S020/S030

Main Street

Douglasdale

Boulevard Bridge

11th Street
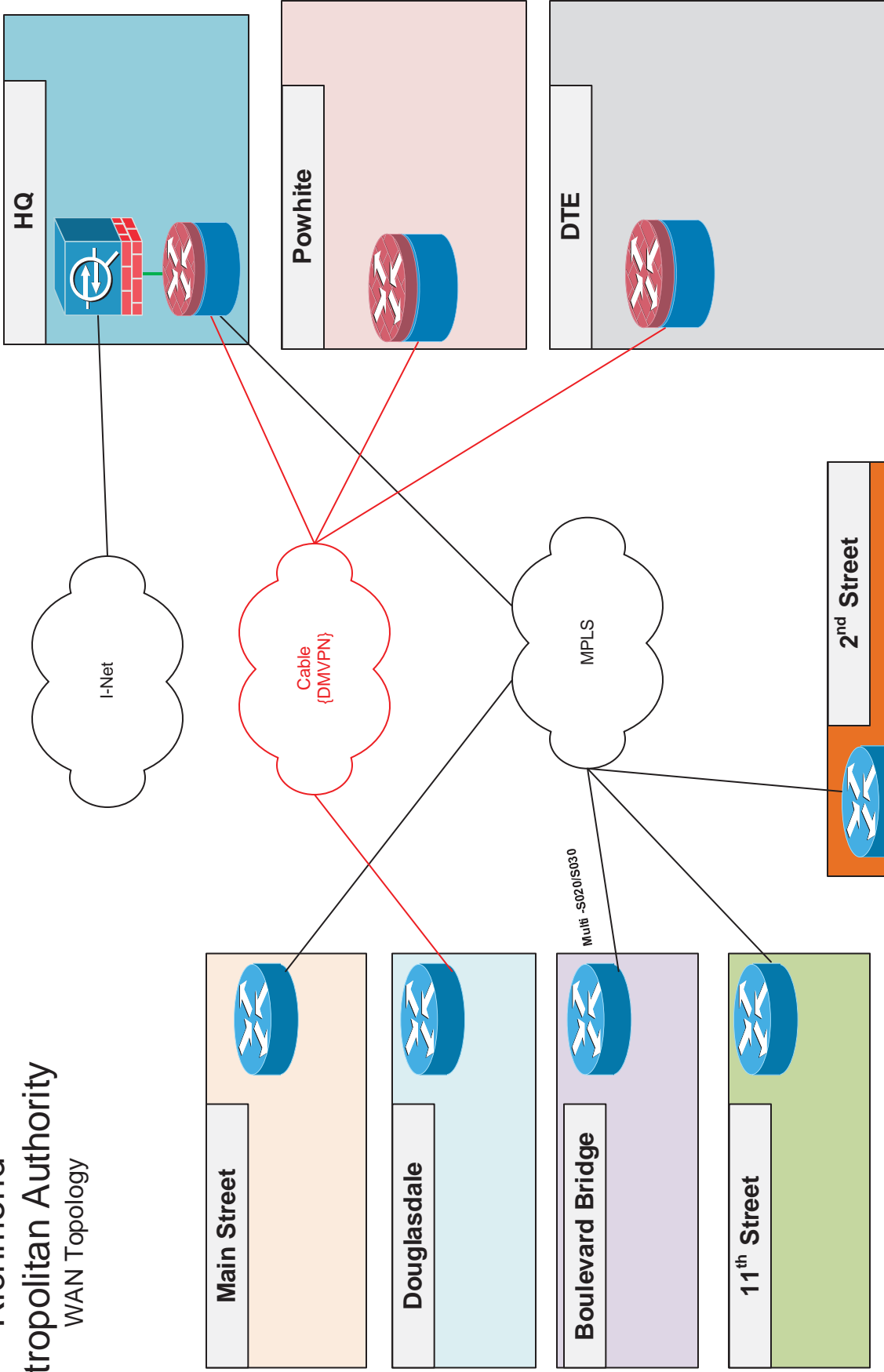
Legend:
1000baseT
Serial MPLS
Circuit
DMVPN

CISCO

Richmond Metropolitan Authority

REVISION HISTORY

Rev.	Date	By:
0.2	12/20/16	DKnapp

CAMPUS NETWORK

DRAWING IS NOT TO SCALE

epitome
networks

TS-03: APPENDIX B

REFERENCE DRAWINGS

Reference Drawings are provided in the pdf file titled: "*TS-03 Appendix B Reference Drawings.pdf*" available from RMTA's website http://www.rmtaonline.org.

The purpose of the TS-03 APPENDIX B Reference Drawings is to provide a general description of certain of the scope and technical requirements of RMTA's Toll Collection System, and RMTA DOES NOT REPRESENT OR WARRANT THAT THE INFORMATION CONTAINED IN TS-03 APPENDIX B REFERENCE DRAWINGS IS EITHER COMPLETE OR ACCURATE OR IN CONFORMITY WITH THE REQUIREMENTS OF RMTA-PROVIDED APPROVALS.   All Proposers are advised that the Work to be undertaken under the RFP is to be performed by the winning Proposer, and each Proposer, by submitting a proposal, understands and agrees that RMTA shall not be responsible or liable in any respect for any losses whatsoever suffered by any Proposer by reason of any use of any information contained in TS-03 APPENDIX B Reference Drawings. Each Proposer further acknowledges and agrees that, by submitting a proposal, (a) if and to the extent it or anyone on its behalf uses any of such information in any way, such use is made on the basis that the Proposer, and not RMTA, has approved and is responsible for such information, and (b) the Proposer is capable of conducting and is obligated hereunder to conduct any and all studies, analyses, diligence and investigations as it deems advisable to verify or supplement such information, and that any use of such information is in all respects at each Proposer's own risk and in its own discretion.

TS-03: APPENDIX C

VDOT SPECIFICATIONS

VDOT Standard Specifications are available on-line at:

http://www.virginiadot.org/business/resources/const/VDOT_2016_RB_Specs.pdf

TS-04

Tolling Specification #04: Host Subsystem

TOLLING SPECIFICATION #04: HOST SUBSYSTEM

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PROJECTED TRAFFIC VOLUMES   APPENDIX D

1. ACRONYMS & KEY TERMS

Acronyms and key terms are defined in Tolling Specification #01.

2. LOCATION

Contract Criteria	
TS-04 Requirement #2-1	The Contractor shall integrate, furnish, install, test and maintain Toll System elements at the Powhite Parkway south plaza administration building to provide all Host Subsystem functions described below.

A Software As A Service (SAAS) or otherwise outsourced or remotely hosted solution for the Host Subsystem is not acceptable to the Authority.

3. FUNCTION & PERFORMANCE

Contract Criteria	
TS-04 Requirement #3-1	The Host Subsystem shall control all Toll System elements.
TS-04 Requirement #3-2	Storage, processor speeds, communications internal to the Host Subsystem and all other aspects of the Host Subsystem design shall be of sufficient capacity to process tolling at the traffic volumes specified in Appendix D of this TS-04 document.
TS-04 Requirement #3-3	The Host Subsystem shall secure all of its data such that it cannot be edited or deleted. All data records and files shall only be appended to and, in all cases where such appending occurs, the Host Subsystem shall "flag" each append to ensure data integrity and provide a complete audit trail.
TS-04 Requirement #3-4	The Host Subsystem shall record and retain all system access, logins, and modifications such that all suspect use is fully traceable.
TS-04 Requirement #3-5	The Host Subsystem shall encrypt data including but not limited to the list of Authority users, their log-in credentials and the user group(s) to which they are assigned.
TS-04 Requirement #3-6	The Host Subsystem shall provide firewalls; intrusion detection and prevention; unauthorized access detection and prevention; virus protection; spam protection, denial-of-service attack protection, and all other system security measures to: • Protect the Toll System from cyber-security risks created or propagated by Toll System users, adjoining systems and third parties • Ensure continued operation of the Toll System in accordance with all contractual requirements and in a manner that does not adversely affect adjoining systems operated by others

Contract Criteria	
TS-04 Requirement #3-7	The Host Subsystem shall log and report the receipt and processing of all data records and files described in sections 3.1 through 3.4 below.
TS-04 Requirement #3-8	The Host Subsystem shall store all data records and files described in sections 3.1 through 3.4 below in a manner that makes it easy for an Authority user(s) to search for a record; locate it; display it; make a copy of it in .pdf file format; make a copy of it in .xlsx format; make a copy of it in .csv format; and email it in any of these formats.
TS-04 Requirement #3-9	The Host Subsystem shall actively monitor the processing of data records and files and log, store and send an alert (see section 3.3.3 below) in the event of any processing failures, errors or stoppages or any degradation in processing performance. Such active monitoring includes but is not limited to "heart beat" methods; file size and frequency methods; and methods based on transmission acknowledgement timing.

3.1. Toll System Management

Contract Criteria	
TS-04 Requirement #3.1-1	The Host Subsystem shall provide single sign on, where an Authority user(s) can access any Toll System element or subsystem using one user name and one password common to all Toll System elements.
TS-04 Requirement #3.1-2	The Host Subsystem shall control all such privileges and access rights through a single software application and by user group.
TS-04 Requirement #3.1-3	The Host Subsystem shall provide one of these user groups with administrator privileges over the entire Toll System and at least two Authority employees shall be initially assigned to this Toll System administrator user group.
TS-04 Requirement #3.1-4	The Host Subsystem shall log all user log-ins, all user log-outs and all user access to Toll System processes and data.
TS-04 Requirement #3.1-5	The Host Subsystem shall display and produce a standard report listing of all Toll System users where such report includes their username, their full name and the user group that each is assigned to. This report shall provide a key that describes and details all access rights and privileges afforded to each user group.
TS-04 Requirement #3.1-6	The Host Subsystem shall provide all tools and functions necessary for an Authority user(s) to change the mode of each zone of the ORT Zone Subsystem and each lane of the Traditional Lane Subsystem.
TS-04 Requirement #3.1-7	The Host Subsystem shall be integrated with a primary and secondary network time protocol (NTP) server and these shall be the same as for all other Toll System elements. Both NTP servers shall be certified NTP servers and subject to approval by the Authority.

Contract Criteria	
TS-04 Requirement #3.1-8	All Toll System elements shall synchronize with these same NTP servers at configurable intervals, no less than every five (5) minutes and all software used for time synchronization shall support monotonic changes to time.
TS-04 Requirement #3.1-9	The Host Subsystem shall provide all tools and functions necessary for an Authority user(s) to perform all system management and administration remotely via the most common Commercial Off The Shelf personal computers and browser applications.
TS-04 Requirement #3.1-10	The Host Subsystem shall provide for all Authority workstations connected to the Authority's wide area network to login and access any Toll System menu or application without having to install Toll System software on said workstation.
TS-04 Requirement #3.1-11	The Toll System shall, based on user privileges and access rights, provide the appropriate menus and screens to an Authority user(s) from any workstation connected to the Authority's wide area network.

Where a parameter or other attribute of the Toll System is described below as configurable, it shall be configurable by both an Authority user(s) and Contractor personnel.

3.1.1. Transponder Status Files

Contract Criteria	
TS-04 Requirement #3.1.1-1	The Host Subsystem shall process, send, load and activate 100% of the updated transponder status lists on each zone controller in the ORT Zone Subsystem and on each lane controller in the Traditional Lane Subsystem within thirty (30) minutes of successfully receiving a full replacement file from the VDOT E-ZPass Customer Service Center.
TS-04 Requirement #3.1.1-2	The Host Subsystem shall process, send, load and activate 100% of individual E-ZPass transponder status updates on each zone controller in the ORT Zone Subsystem and on each lane controller in the Traditional Lane Subsystem within fifteen (15) minutes of successfully receiving the incremental status file update from the VDOT E ZPass Customer Service Center.
TS-04 Requirement #3.1.1-3	The Host Subsystem shall actively monitor such processing, transmission, loading and activating and the Host Subsystem shall log, store and send an alert (see section 3.3.3 below) in the event of any failures, errors or stoppages or any degradation in performance.

3.1.2. Toll Rate Schedule

Contract Criteria	
TS-04 Requirement #3.1.2-1	The Host Subsystem shall provide for an Authority user(s) to create new toll rate schedules; store such toll rate schedules on the Host Subsystem; specify the date and time at which such toll rate schedules will be transmitted to the ORT Zone Subsystem and Traditional Lane Subsystem; and specify the date and time at which such toll rate schedules will be placed into revenue service.
TS-04 Requirement #3.1.2-2	The Host Subsystem shall provide for an Authority user(s) to perform such toll rate schedule development and release activities from any workstation connected to the Authority's wide area network. The Contractor shall develop the process checks and balances, information system security and other aspects of these activities prior to the Midpoint Design Review Milestone, subject to the Authority's approval.
TS-04 Requirement #3.1.2-3	Each such toll rate schedule shall have one set of toll rates (based on vehicle class) when toll payments are made with coins and another corresponding set of toll rates when an E-ZPass transponder (with a status of "valid" or "low balance") is used.
TS-04 Requirement #3.1.2-4	Each such toll rate schedule shall provide for coin toll rates to be different from the E-ZPass toll rates at the same location.

3.1.3. Authority User List

Contract Criteria	
TS-04 Requirement #3.1.3-1	The Host Subsystem shall provide screens and tools for any user in the Toll System administrator user group to: • Manage every other user group's access security including sign-on facilities, permission control and different levels of access for the files and directories • Assign users to any user group and change that assignment from time to time
TS-04 Requirement #3.1.3-2	The Host Subsystem shall provide strict controls of these system administrator functions.
TS-04 Requirement #3.1.3-3	Upon any update of user rights or privileges, the Host Subsystem shall immediately transmit said update to the ORT Zone Subsystem and Traditional Lane Subsystem.
TS-04 Requirement #3.1.3-4	All Toll System elements shall load and use such updated rights or privileges without re-booting or otherwise impacting the performance of any element of the Toll System.

Contract Criteria	
TS-04 Requirement #3.1.3-5	For each user, the Host Subsystem shall display all screens and reports available to them based on their assigned user group. On some screens, the Host Subsystem shall limit certain user groups to only viewing data and not entering data. On other screens, the Host Subsystem shall limit certain user groups from even viewing the data.

3.1.4. ID Card List

Contract Criteria	
TS-04 Requirement #3.1.4-1	The Host Subsystem shall provide screens and tools for an Authority user(s) to add, change and delete ID card user information and status on the ID card list.
TS-04 Requirement #3.1.4-2	The Host Subsystem shall provide an Authority user(s), through use of their ID card and password, to place any traditional lane into maintenance mode from the associated Manual Lane Terminal (described in the TS-06 document) or any other Manual Lane Terminal.
TS-04 Requirement #3.1.4-3	The Host Subsystem shall provide an Authority user(s), through use of their ID card and password, to place any ORT zone into maintenance mode from any Manual Lane Terminal.

3.2. Transaction Processing

Proposal Criteria
As part of their proposal, the Offeror shall detail their experience and familiarity with the VDOT E-ZPass Customer Service Center interface specifications and operating procedures.

Contract Criteria	
TS-04 Requirement #3.2-1	The Host System shall provide for an Authority user(s) to manually close a Revenue Day and automatically store, log and provide an alert (see section 3.3.3 below) of such manual Revenue Day closure.
TS-04 Requirement #3.2-2	The Host Subsystem shall provide for an Authority user(s) to securely generate queries using screens based on date range; transponder data fields including but not limited to agency, serial number, programmed class and switch setting; transponder type; and transponder status (as declared by the VDOT E-ZPass Customer Service Center) to obtain the related transaction records.
TS-04 Requirement #3.2-3	The Host Subsystem shall log all such searches, displays, copies made, and e-mails sent.

Other requirements and the Key Performance Indicators for toll processing are detailed in Tolling Specification #02.

Each Revenue Day operates from 00:00 AM to 24:00 AM Eastern Time and compliant with standard time or daylight savings time. Other business rules related to each type of transaction record below will be determined during design and subject to the Authority's approval.

3.2.1. E-ZPass Transactions

The generation of E-ZPass Transaction records by the ORT Zone Subsystem is described in the TS-05 document. The generation of E-ZPass Transaction records by the Traditional Lane Subsystem is described in the TS-06 document.

Contract Criteria	
TS-04 Requirement #3.2.1-1	The Host Subsystem shall receive, process and store all E-ZPass Transaction records from all ORT Zone Subsystem locations and from all Traditional Lane Subsystem locations.
TS-04 Requirement #3.2.1-2	The Host Subsystem shall log and report the receipt and processing of all such E-ZPass Transaction records.
TS-04 Requirement #3.2.1-3	The Host Subsystem shall attribute each E-ZPass Transaction to the Revenue Day in which the vehicle actually passed through the toll lane or zone.
TS-04 Requirement #3.2.1-4	The Host Subsystem shall provide screens and reports showing the details of each E-ZPass Transaction record and comprehensive summaries of E-ZPass Transactions.

Requirements for transmitting these transaction records to the VDOT E-ZPass Customer Service Center are described in section 3.6.1 below.

3.2.2. Non-Revenue Transactions

The generation of Non-Revenue Transaction records by the ORT Zone Subsystem is described in the TS-05 document. The generation of Non-Revenue Transaction records by the Traditional Lane Subsystem is described in the TS-06 document.

Contract Criteria	
TS-04 Requirement #3.2.2-1	The Host Subsystem shall receive, process and store all Non-Revenue Transaction records from all ORT Zone Subsystem locations and from all Traditional Lane Subsystem locations.
TS-04 Requirement #3.2.2-2	The Host Subsystem shall log and report the receipt and processing of all such Non-Revenue Transaction records.

Contract Criteria	
TS-04 Requirement #3.2.2-3	The Host Subsystem shall provide screens and reports of Non-Revenue Transaction record details and comprehensive summary data.

Transactions occurring via employee identification cards are described in section 3.2.6 below.

3.2.3. Image Transactions

The generation of Image Transaction records by the ORT Zone Subsystem is described in the TS-05 document. The generation of Image Transaction records by the Traditional Lane Subsystem is described in the TS-06 document.

Contract Criteria	
TS-04 Requirement #3.2.3-1	The Host Subsystem shall receive, process and store all Image Transaction records from all ORT Zone Subsystem locations.
TS-04 Requirement #3.2.3-2	The Host Subsystem shall receive, process and store all Image Transaction records from the Traditional Lane Subsystem (lanes where the Contractor furnished and installed violations enforcement cameras).
TS-04 Requirement #3.2.3-3	The Host Subsystem shall log and report the receipt and processing of all such Image Transaction records.
TS-04 Requirement #3.2.3-4	The Host Subsystem shall attribute each Image Transaction to the Revenue Day in which the vehicle actually passed through the toll lane or zone.
TS-04 Requirement #3.2.3-5	For each Image Transaction record generated by the ORT Zone Subsystem, the Host Subsystem shall coordinate and log the transmission of one complete set, and only one complete set, of violation images to the VDOT E-ZPass Customer Service Center.
TS-04 Requirement #3.2.3-6	For each Image Transaction record generated by the Traditional Lane Subsystem, the Host Subsystem shall coordinate and log the transmission of one complete set, and only one complete set, of violation images to the VDOT E-ZPass Customer Service Center.
TS-04 Requirement #3.2.3-7	The Host Subsystem shall log and report all such transmissions and attempted transmissions of violation image sets to the VDOT E-ZPass Customer Service Center.
TS-04 Requirement #3.2.3-8	The Host Subsystem shall provide screens and reports showing the details of each Image Transaction record and comprehensive summaries of Image Transactions.

Requirements for transmitting these transaction records to the VDOT E-ZPass Customer Service Center are described in section 3.6.1 below.

3.2.4. ACM Transactions

The generation of ACM Transaction records by the Traditional Lane Subsystem is described in the TS-06 document.

	Proposal Criteria
As part of their proposal, the Offeror shall detail their proposed Host Subsystem's financial reporting screens, reports and other audit functions related to ACM transactions.	

Contract Criteria	
TS-04 Requirement #3.2.4-1	The Host Subsystem shall receive, process and store all ACM Transaction records from the Traditional Lane Subsystem.
TS-04 Requirement #3.2.4-2	The Host Subsystem shall provide comprehensive financial reporting screens, reports and other audit functions related to ACM Transaction records.
TS-04 Requirement #3.2.4-3	The Host Subsystem shall attribute each ACM Transaction record to a Revenue Day based on the vault switch time and vault pull time, as further defined during the design phase and subject to the Authority's approval.
TS-04 Requirement #3.2.4-4	The Host Subsystem shall provide screens and reports showing the details of each ACM Transaction record and comprehensive summaries of ACM Transactions.

3.2.5. Manual ISF Transactions

The generation of Manual ISF Transaction records by the Traditional Lane Subsystem is described in the TS-06 document.

	Proposal Criteria
As part of their proposal, the Offeror shall detail their proposed Host Subsystem's financial reporting screens, reports and other audit functions related to insufficient funds.	

Contract Criteria	
TS-04 Requirement #3.2.5-1	The Host Subsystem shall receive, process and store all Manual ISF Transaction records from the Traditional Lane Subsystem.
TS-04 Requirement #3.2.5-2	The Host Subsystem shall provide an Authority user(s) with the tools and functions to record a payment subsequently received by the Authority and attribute this payment amount to the balance due for the corresponding Manual ISF Transaction.

Contract Criteria	
TS-04 Requirement #3.2.5-3	The Host Subsystem shall provide comprehensive financial reporting screens, reports and other audit functions related to Manual ISF Transactions.
TS-04 Requirement #3.2.5-4	The Host Subsystem shall provide screens and reports showing the details of each Manual ISF Transaction record and comprehensive summaries of Manual ISF Transactions.

3.2.6. ID Card Transactions

The generation of ID Card Transaction records by the Traditional Lane Subsystem is described in the TS-06 document.

Proposal Criteria
As part of their proposal, the Offeror shall detail their proposed Host Subsystem's card management, financial reporting screens, reports and other audit functions related to ID cards issued to allow toll-free passage.

Contract Criteria	
TS-04 Requirement #3.2.6-1	The Host Subsystem shall receive, process and store all ID Card Transaction records from the Traditional Lane Subsystem.
TS-04 Requirement #3.2.6-2	The Host Subsystem shall provide screens and reports showing the details of each ID Card Transaction record and comprehensive summaries of ID Card Transactions.

3.2.7. Vault Coin Counts

Motorists must make all cash toll payments in coins, using exact change and processed by the Automatic Coin Machines. The Authority's toll collection attendants only role in cash collection is to make change for motorists. There is no requirement for the Toll System to process records or other inputs related to the toll collection attendant cash drawers.

Counting room functions are outsourced to the Authority's armored car firm, which provides electronic files to the Authority with the ACM vault count information in a comma separated value format.

Contract Criteria	
TS-04 Requirement #3.2.7-1	The Host Subsystem shall receive, log, store and process all vault counts from the Traditional Lane Subsystem (see the TS-06 document).

Contract Criteria	
TS-04 Requirement #3.2.7-2	The Host Subsystem shall process all vault count files received from the armored car company.
TS-04 Requirement #3.2.7-3	The Host Subsystem shall produce detailed screens and reports that track and compare the count information for each vault from the Traditional Lane Subsystem with corresponding count information from the armored car company.
TS-04 Requirement #3.2.7-4	The Host Subsystem shall provide for an Authority user(s) to adjust vault numbers and vault amounts.
TS-04 Requirement #3.2.7-5	The Host Subsystem shall ensure the integrity of these vault counts by providing a complete audit trail showing and attributing all such adjustments.

There is no requirement for the Toll System to process records from the Authority's bank.

3.3. MOMS

Proposal Criteria
As part of their proposal, the Offeror shall detail the Maintenance On-Line Management Subsystem (MOMS) function and dashboard.
As part of their proposal, the Offeror shall describe any MOMS functions that are additionally provided by a mobile application and the associated hosting arrangement, if any, provided at no additional cost to the Authority.
As part of their proposal, the Offeror shall describe all installations in the last three years where the Offeror has provided MOMS function and describe the similarities and differences between the proposed Host Subsystem MOMS function and each of these previous installations.

3.3.1. Health Monitoring

Contract Criteria	
TS-04 Requirement #3.3.1-1	The Host Subsystem shall provide screens and other tools for an Authority user(s) and Contractor personnel to manually report or record reports of Toll System issues conveyed verbally or via e-mail.

Contract Criteria	
TS-04 Requirement #3.3.1-2	The Host Subsystem shall provide health monitoring of all Toll System hardware and software elements; processes; process automation; interfaces; and data including but not limited to the following: • Low storage space for each subsystem • CPU utilization • CPU load • File system mounts • Disk inputs and outputs • Automatic job/workflow/queue exceptions for all data that is not processing correctly or otherwise "hung in the system"
TS-04 Requirement #3.3.1-3	The Host Subsystem shall proactively monitor the health of the Host Subsystem, ORT Zone Subsystem, Traditional Lane Subsystem and any other Toll System elements at configurable intervals, no less often than every five (5) minutes.
TS-04 Requirement #3.3.1-4	The Host Subsystem shall monitor the health of all E-ZPass readers, whether furnished by the Contractor or otherwise installed, by tracking the percentage of transactions without an E-ZPass transponder against location-specific thresholds configurable by an Authority user(s).
TS-04 Requirement #3.3.1-5	The Host Subsystem shall proactively monitor, log and report all communication between all Toll System elements at configurable intervals, no less often than every five (5) minutes.
TS-04 Requirement #3.3.1-6	The Host Subsystem shall proactively monitor, log and report all message queues and system processes at configurable intervals, no less often than every five (5) minutes.
TS-04 Requirement #3.3.1-7	The Host Subsystem shall monitor, log and report all communication between the Toll System and the VDOT E-ZPass Customer Service Center including successful transmissions; periodic file transmissions that are overdue or occurring too often; serialized file transmissions with missing or out of sequence data; file contents indicating network communication or data generation issues; and other communications faults and anomalies.
TS-04 Requirement #3.3.1-8	The Host Subsystem shall monitor the quality of all (electric utility, Authority UPS and/or Authority generator) power supplied to all Toll System elements.
TS-04 Requirement #3.3.1-9	The Host Subsystem shall consolidate, store, provide dashboard screens (see section 3.3.2 below), provide alerts (see section 3.3.3 below) and provide comprehensive reports (see section 3.3.9 below) for all Toll System health monitoring including but not limited to the monitoring described above.
TS-04 Requirement #3.3.1-10	The Host Subsystem shall log and store all data for calculating Key Performance Indicators including but not limited to those listed in Tolling Specification #02 and all items that factor into these calculations.

Contract Criteria	
TS-04 Requirement #3.3.1-11	Each stored item above shall be stored in a manner that makes it easy for an infrequent Authority user(s) to search for it, locate it, display it, make a copy of it in .pdf file format, make a copy of it in .xlsx format, make a copy of it in .csv format, and email it in any of these formats.

3.3.2. Dashboard

Contract Criteria	
TS-04 Requirement #3.3.2-1	The Host Subsystem shall provide a configurable real-time dashboard showing all Toll System monitoring information.
TS-04 Requirement #3.3.2-2	This dashboard shall show Toll System status in a color-coded pictorial view and assist Authority users in easily "drilling down" to view both summary and detailed operating data of each underlying Toll System element causing an alert and its associated error logs.
TS-04 Requirement #3.3.2-3	This dashboard shall show the name of all files transmitted between the Host Subsystem, the ORT Zone Subsystem, the Traditional Lane Subsystem and the VDOT E-ZPass Customer Service Center with the time of each such transmission.
TS-04 Requirement #3.3.2-4	This dashboard shall show the filenames and other version information of the VDOT E-ZPass Customer Service Center transponder status file(s) currently being used by each ORT Zone Subsystem process; by each Traditional Lane Subsystem process; and by each Host Subsystem process. This dashboard shall also show the time such transponder status file was put into use by each of these processes and provide function that enables Authority users to drill down and view previous filenames, versions and the time each previous transponder status file was put into use by each such process.
TS-04 Requirement #3.3.2-5	This dashboard shall provide an Authority user(s) with an easy method of re-initiating any transmissions that were not successful (e.g. transponder status lists).

3.3.3. Alerts

Contract Criteria	
TS-04 Requirement #3.3.3-1	The Host Subsystem shall provide alerts to an Authority user(s) of each Toll System failure, fault and other unusual events affecting the Toll System performance.
TS-04 Requirement #3.3.3-2	The Host Subsystem shall provide such alerts as an immediate e-mail, as an immediate text message and as reports initiated by the system.

Contract Criteria	
TS-04 Requirement #3.3.3-3	The Host Subsystem shall generate, store, send and log the transmission of each such alert.
TS-04 Requirement #3.3.3-4	The Host Subsystem shall provide for an Authority user(s) to easily and automatically generate a corresponding work order for each alert, where such user action does not in any way relieve the Contractor from any Contract obligation.
TS-04 Requirement #3.3.3-5	The Host Subsystem shall provide for an Authority user(s) to easily comment on the alert and have that comment reflected in reports about the alert and reports of Toll System performance.
TS-04 Requirement #3.3.3-6	The Host Subsystem shall provide all of the screens and tools for an Authority user(s) to select any and all types of alerts they wish to be notified of, the associated notification method(s), the associated threshold that must be reached prior to each alert type being sent by each notification method and the maximum frequency with which each alert type will be sent by each notification method.
TS-04 Requirement #3.3.3-7	The Host Subsystem shall configure its operation for each user based on their selections and such configuration shall apply in all cases until such time as the Authority user initiates new selections.
TS-04 Requirement #3.3.3-8	Where the Toll System issues an alert to an Authority user(s), such alert shall also be issued to Contractor personnel.
TS-04 Requirement #3.3.3-9	The Host Subsystem shall similarly generate, store, send and log an alert notifying an Authority user (s) of each planned, started, on-going and completed system maintenance activity.

3.3.4. Work Orders

Contract Criteria	
TS-04 Requirement #3.3.4-1	The Host Subsystem shall generate, store, assign, track and log work orders for all preventive maintenance, corrective maintenance, predictive maintenance and all other Toll System field work.
TS-04 Requirement #3.3.4-2	The Host Subsystem shall provide for an Authority user(s) to electronically initiate work orders, search for work orders, review work orders, transfer work orders and close work orders electronically from workstations, laptops, tablets and mobile phones on a 24/7 basis.
TS-04 Requirement #3.3.4-3	The Host Subsystem shall initiate, store and log reports showing the status of all work orders.
TS-04 Requirement #3.3.4-4	The Host Subsystem shall log, store and send an alert (see section 3.3.3 above) each time a work order is assigned, updated or closed.

3.3.5. Parts Tracking

Contract Criteria	
TS-04 Requirement #3.3.5-1	The Host Subsystem shall track all Toll System elements including but not limited to each field replaceable unit and all associated spare parts.
TS-04 Requirement #3.3.5-2	The Host Subsystem shall import and store the version and serial number, the current location, all past locations, current condition and all repair history of all Toll System equipment.
TS-04 Requirement #3.3.5-3	The Host Subsystem shall: a) Provide tracking of all maintenance and service agreements b) Maintain a list of vendors from where products were procured c) Associate the original purchase order number to the individual item d) Associate the original vendor number to the individual item e) Associate all warranty information to the individual item f) Provide an alert prior to warranty expiration
TS-04 Requirement #3.3.5-4	The Host Subsystem shall import and store all communications with vendors regarding all defective parts and all damaged parts.
TS-04 Requirement #3.3.5-5	The Host Subsystem shall generate and store all requests for Returned Material Authorization requests based on warranty standing.
TS-04 Requirement #3.3.5-6	The Host Subsystem shall import and store all Returned Material Authorization records provided by vendors.
TS-04 Requirement #3.3.5-7	The Host Subsystem shall generate and store all shipping information for all parts sent to a vendor for repair or replacement.
TS-04 Requirement #3.3.5-8	The Host Subsystem shall import and store all vendor disposition information, all vendor invoicing information and all vendor payment information for all parts sent to a vendor for repair or replacement.
TS-04 Requirement #3.3.5-9	The Host Subsystem shall issue an alert when spare parts inventory is reduced to a configurable threshold quantity.
TS-04 Requirement #3.3.5-10	Each stored item above shall be stored in a manner that makes it easy for an infrequent Authority user(s) to search for it, locate it, display it, make a copy of it in .pdf file format, make a copy of it in .xlsx format, make a copy of it in .csv format, and email it in any of these formats.

3.3.6. Software Asset Management

Contract Criteria	
TS-04 Requirement #3.3.6-1	The Host Subsystem shall import, index and store the licenses of all Commercial Off The Shelf (COTS) software products installed on the Toll System.
TS-04 Requirement #3.3.6-2	The Host Subsystem shall provide for the entry and storage of all dates on which support by the manufacturer of each Commercial Off The Shelf (COTS) software product will change or end.
TS-04 Requirement #3.3.6-3	The Host Subsystem shall log and store the date and time when all software patches, fixes and other changes available from the manufacturer of the Commercial Off The Shelf (COTS) software products were installed on the Toll System.
TS-04 Requirement #3.3.6-4	The Host Subsystem shall log and store the date and time when all software patches, fixes and other changes to software other than COTS products were installed on the Toll System.
TS-04 Requirement #3.3.6-5	The Host Subsystem shall provide for an Authority user(s) to record all testing conducted prior to installation and after installation of all software patches, fixes and other changes.
TS-04 Requirement #3.3.6-6	The Host Subsystem shall log, store and send an alert (see section 3.3.3 above) each time a patch, fix or update becomes available from the manufacturer of the COTS software and each time such a change is installed.
TS-04 Requirement #3.3.6-7	The Host Subsystem shall log, store and send an alert (see section 3.3.3 above) daily for each COTS software license that is due to lapse in the next sixty (60) days.
TS-04 Requirement #3.3.6-8	Each stored item above shall be stored in a manner that makes it easy for an infrequent Authority user(s) to search for it, locate it, display it, make a copy of it in .pdf file format, make a copy of it in .xlsx format, make a copy of it in .csv format, and email it in any of these formats.

3.3.7. Enclosure Monitoring

Contract Criteria	
TS-04 Requirement #3.3.7-1	The Host Subsystem shall log, store and send an alert (see section 3.3.3 above) each time an equipment enclosure is opened or closed in the Host Subsystem (see the TS-04 document); the ORT Zone Subsystem (see the TS-05 document); and the Traditional Lane Subsystem (see the TS-06 document).
TS-04 Requirement #3.3.7-2	Such logs shall include but are not limited to date and time of door open; comprehensive Toll System status at time of door open; date and time of door close; and comprehensive Toll System status at time of door close.

Contract Criteria	
TS-04 Requirement #3.3.7-3	The Host Subsystem shall provide configurable temperature and humidity thresholds for each equipment enclosure.
TS-04 Requirement #3.3.7-4	The Host Subsystem shall log, store and send an alert (see section 3.3.3 above) each time the respective temperature or humidity threshold is reached in a Host Subsystem; ORT Zone Subsystem; or Traditional Lane Subsystem enclosure.
TS-04 Requirement #3.3.7-5	This enclosure monitoring function shall automatically shut down all equipment in an enclosure, whenever the corresponding temperature or humidity threshold is reached and send another alert (see section 3.3.3 above) reporting completion of the shutdown. Such shutdown shall prevent loss or corruption of any data including but not limited to Maintenance Online Management Subsystem data, Vehicle Records, other ORT Zone Subsystem data and data received from the VDOT E-ZPass Customer Service Center.
TS-04 Requirement #3.3.7-6	Each stored item above shall be stored in a manner that makes it easy for an infrequent Authority user(s) to search for it, locate it, display it, make a copy of it in .pdf file format, make a copy of it in .xlsx format, make a copy of it in .csv format, and email it in any of these formats.

3.3.8. System Security

Proposal Criteria
The Offeror shall detail the original manufacturer, full product name, version number, license type and summary of license terms of all COTS software proposed for firewalls; intrusion detection and prevention; unauthorized access detection and prevention; virus protection; spam protection, denial-of-service attack protection, and all other system security measures. Such detail shall include a listing of all of the Toll System elements on which such software will be installed and a detailed description of the extent to which such installation provides the required safeguards.

Contract Criteria	
TS-04 Requirement #3.3.8-1	The Host Subsystem shall provide comprehensive firewall; intrusion detection and prevention; unauthorized access detection and prevention; virus protection; spam protection; denial-of-service attack protection; and all other system security measures that: • Protect the Toll System from cyber-security risks created or propagated by Toll System users, adjoining systems and third parties • Ensure continued operation of the Toll System in accordance with all contractual requirements and in a manner that does not adversely affect adjoining systems operated by others

Contract Criteria	
TS-04 Requirement #3.3.8-2	The Host Subsystem shall check for all updates for all such software from their original manufacturer according to the schedule in the Management Plan, developed during the design phase; log all updates found; include such logs in reports; and store, log and send an alert for each update found. Such schedule shall be configurable, with a maximum time between each such update check no greater than the recommendation of the original manufacturer of the respective software.
TS-04 Requirement #3.3.8-3	The Host Subsystem shall provide for all such updates to be automatically downloaded and applied; however, the Host Subsystem shall be readily configurable by an Authority user(s) to turn off such automatic updates and instead automatically subject each such update to approval of an Authority user(s) prior to download or approval of an Authority user(s) prior to installation. Such configuration shall be on a product by product basis.
TS-04 Requirement #3.3.8-4	This security function shall record and track user sign-on access and access failures, both local and remote, to any element of the Toll System for security audit proposes.
TS-04 Requirement #3.3.8-5	The Host Subsystem shall log, store and send an alert (see section 3.3.3 above) each time there is a sign-on access failure.
TS-04 Requirement #3.3.8-6	The Host Subsystem shall continuously monitor for unauthorized access and shall log, store and send an alert (see section 3.3.3 above) each time unauthorized access is attempted.
TS-04 Requirement #3.3.8-7	The Host Subsystem shall separately generate and send a report (see section 3.3.9 below) to the designated Authority user(s) within 24 hours of each such sign-on access failure and each such unauthorized access attempt.

3.3.9. Reports

Contract Criteria	
TS-04 Requirement #3.3.9-1	The Host Subsystem shall provide all screens and tools for an Authority user(s) to generate detailed reports of health monitoring (see section 3.3.1 above) using the criteria and report templates described in the System Detailed Design document (see Tolling Specification #01).
TS-04 Requirement #3.3.9-2	The Host Subsystem shall provide comprehensive reports of Toll System performance.
TS-04 Requirement #3.3.9-3	The Host Subsystem shall provide all screens and tools for an Authority user(s) to generate reports for alerts (see section 3.3.3 above) using the criteria and report templates described in the System Detailed Design document.

Contract Criteria	
TS-04 Requirement #3.3.9-4	Such alert reports shall include the Contractor's response including but not limited to time to acknowledge, time to respond, time to repair, troubleshooting activities conducted, field replaceable units removed and field replaceable units installed during the associated response(s).
TS-04 Requirement #3.3.9-5	The Host Subsystem shall provide all screens and tools for an Authority user(s) to generate reports for work orders (see section 3.3.4 above) using the criteria and report templates described in the System Detailed Design document.
TS-04 Requirement #3.3.9-6	The Host Subsystem shall provide all screens and tools for an Authority user(s) to generate reports for parts tracking (see section 3.3.5 above) using the criteria and report templates described in the System Detailed Design document.
TS-04 Requirement #3.3.9-7	The Host Subsystem shall provide all screens and tools for an Authority user(s) to generate reports for software asset management (see section 3.3.6 above) using the criteria and report templates described in the System Detailed Design document.
TS-04 Requirement #3.3.9-8	The Host Subsystem shall provide all screens and tools for an Authority user(s) to generate reports for enclosure monitoring (see section 3.3.7 above) using the criteria and report templates described in the System Detailed Design document.
TS-04 Requirement #3.3.9-9	The Host Subsystem shall provide all screens and tools for an Authority user(s) to generate reports for system security (see section 3.3.8 above) using the criteria and report templates described in the System Detailed Design document.
TS-04 Requirement #3.3.9-10	The Host Subsystem shall provide all screens and tools for an Authority user(s) to generate reports for other aspects of the Toll System including but not limited to: a) Total system availability b) Performance reports detailing compliance to the performance requirements c) Equipment repair history, with a comprehensive status of removed parts, parts under repair and spare parts d) Trend analysis for repetitive failure e) An exceptions report summarizing all unusual occurrences during the period and associated lost revenue estimates The Contractor shall develop the exceptions report and the methodology for estimating lost revenue subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-04 Requirement #3.3.9-11	Each report above shall be implemented in a manner that makes it easy for an infrequent Authority user(s) to initiate it, display it, make a copy of it in .pdf file format, make a copy of it in .xlsx format, make a copy of it in .csv format, and email it in any of these formats.
TS-04 Requirement #3.3.9-12	Criteria, report templates and associated file types selected by Authority users (e.g. the "user settings") shall apply in all cases until such time as the Authority user specifically revises the settings.

Additional MOMS requirements are specified in the TS-05 (ORT Zone Subsystem) and TS-06 (Traditional Lane Subsystem) documents.

3.4. Digital Video Audit

The generation of this video data by the ORT Zone Subsystem is described in the TS-05 document. The generation of this video data by the Traditional Lane Subsystem is described in the TS-06 document.

	Proposal Criteria
As part of their proposal, the Offeror shall detail the Digital Video Audit function of the proposed Host Subsystem and provide images of its most commonly used screens.	
As part of their proposal, the Offeror shall describe how the Digital Video Audit function exports data to portable media and detail the types of media supported by the proposed Host Subsystem.	
As part of their proposal, the Offeror shall detail the file format saved by the Digital Video Audit function of the proposed Host Subsystem and all compatible Microsoft Windows, Apple IOS and Google Android video viewers available at no additional charge to the Authority and third parties.	
As part of their proposal, the Offeror shall identify the toll agency(ies) where Digital Video Audit function at or near the version proposed here is being used effectively and provide contact information of the employee of each such agency that is one of the most intensive users of function.	

Contract Criteria	
TS-04 Requirement #3.4-1	The Toll System shall provide a browser-based Graphical User Interface (GUI) application for authorized Authority users to access Digital Video Audit function from Authority workstations connected to the Authority's wide area network.
TS-04 Requirement #3.4-2	The Toll System shall provide Digital Video Audit function with all screens and tools necessary to monitor an overall video image of each ORT Zone Subsystem and Traditional Lane Subsystem location and each vehicle as it travels through these locations.
TS-04 Requirement #3.4-3	Such screens and tools shall display the associated transaction data including but not limited to transaction record number, time, day, lane number, toll collection attendant employee number, Plaza Supervisor employee number, E-ZPass transponder number, vehicle class programmed into the E-ZPass transponder, vehicle class as determined by other Toll System sensors, toll amount due and toll amount paid in cash.
TS-04 Requirement #3.4-4	For all Traditional Lane Subsystem lanes, such screens and tools shall display all toll collection attendant button pushes and the status and information of all displays and signals connected to the Toll System.
TS-04 Requirement #3.4-5	For all ORT Zone Subsystem lanes and all Traditional Lane Subsystem lanes equipped with violation enforcement cameras, such screens and tools shall display any potential violation images as they occur.

Contract Criteria	
TS-04 Requirement #3.4-6	The Digital Video Audit function shall provide all screens and tools necessary for an Authority user(s) to search for and playback video images, associated transaction data and potential violation images by criteria including but not limited to transaction time range, lane number, lane/zone mode, transaction record number, violation record number, E-ZPass transponder number and toll collection attendant employee number, alarm condition, class mismatch condition, collector button presses and unusual occurrence type.
TS-04 Requirement #3.4-7	The Digital Video Audit function shall provide for an Authority user(s) to quickly and easily save any screen in .pdf format.
TS-04 Requirement #3.4-8	The Digital Video Audit function shall provide for an Authority user(s) to quickly and easily copy and store all video and overlay information to electronic files in MPEG-4 format and store these files on standard DVD-RW removable media, store these files on USB device removable media or directly send these files to others via e-mail.
TS-04 Requirement #3.4-9	The Host Subsystem shall provide all function necessary to consolidate, track and report all user searches of Digital Video Audit information.
TS-04 Requirement #3.4-10	The Host Subsystem shall provide all function necessary to consolidate, track and report all user exports of Digital Video Audit information.
TS-04 Requirement #3.4-11	The Host Subsystem shall provide all function necessary to track, consolidate and report the details of each users' viewing of Digital Video Audit information stored on the Toll System.
TS-04 Requirement #3.4-12	All images and transaction data accessible by the Host Subsystem Digital Video Audit function shall be read-only.
TS-04 Requirement #3.4-13	The Digital Video Audit function shall support four (4) concurrent Authority users with no degradation in performance.
TS-04 Requirement #3.4-14	The Host Subsystem shall monitor the health of its Digital Video Audit function and notify the system administrator, maintenance personnel and other MOMS users of any failure or degradation.

Additional Digital Video Audit requirements are specified in the TS-05 (ORT Zone Subsystem) and TS-06 (Traditional Lane Subsystem) documents.

3.5. Fault Tolerance

The Host Subsystem location is specified in section 2 above. The Authority does not require redundant Host Subsystem elements at two physically separate locations; however, the Contractor may (at the Contractor's sole expense) furnish and install additional Host Subsystem elements at the DTE Plaza location.

	Proposal Criteria
As part of their proposal, the Offeror shall detail the fault tolerance of the proposed Host Subsystem.	

Contract Criteria	
TS-04 Requirement #3.5-1	The Host Subsystem shall have fully redundant hot-swappable power supplies.
TS-04 Requirement #3.5-2	The Host Subsystem shall have RAID 1 or RAID 5 storage configured to automatically switch-over and continue operating without degradation in performance or loss of data in the event of a failure in any disk drive.
TS-04 Requirement #3.5-3	Such RAID storage shall allow failed drives to be replaced and rebuilt while the Host Subsystem is fully operational and processing transactions and reports with no degradation in performance.

3.6. Network

As described in Appendix A of the TS-03 document, the Authority will provide two (2) fully provisioned network demarcation points at the Powhite Parkway Plaza location. One is a single mode Lucent connector to the Authority's wide area network. The other is a single mode Lucent connector to the wide area network for the VDOT E-ZPass Customer Service Center. Both demarcation points will be located within 50' of the Host Subsystem location.

Contract Criteria	
TS-04 Requirement #3.6-1	The Host Subsystem shall provide and include all hardware, software and cabling for connecting the Toll System to the networks described below and all such elements shall be part of the Toll System.

3.6.1. VDOT E-ZPass Customer Service Center

The ORT Zone Subsystem is required to transmit violation image files directly to the VDOT E-ZPass Customer Service Center as described in the TS-05 document. The Traditional Lane Subsystem is required to transmit violation image files directly to the VDOT E ZPass Customer Service Center as described in the TS-06 document.

As further described in these TS-05 and TS-06 documents, due to existing limitations of the Authority's network, the Toll System is required to transmit violation image sets directly from the DTE Plaza and Boulevard Bridge locations to the VDOT Customer Service Center via a wide area network demarcation point located at the DTE Plaza.

The Authority will provide sufficient capacity on the Authority wide area network to move transaction and violation data (other than image files) between the DTE Plaza and the Powhite Parkway Plaza locations

Proposal Criteria
As part of their proposal, the Offeror shall detail and quantify the Toll System file sizes, weekday file quantities and anticipated network bandwidth between the Boulevard Bridge location and the DTE Plaza.
As part of their proposal, the Offeror shall detail and quantify the Toll System file sizes, weekday file quantities and anticipated network bandwidth between the DTE Plaza location and the Host Subsystem (at the Powhite Parkway Plaza).
As part of their proposal, the Offeror shall detail and quantify the Toll System file sizes, weekday file quantities and anticipated network bandwidth between the Host Subsystem and the VDOT E-ZPass Customer Service Center location.

Contract Criteria	
TS-04 Requirement #3.6.1-1	The Host Subsystem shall receive transponder status files from the VDOT E-ZPass Customer Service Center as described in the Black Box Interface (see Appendix A of this TS-04 document) and store such files.
TS-04 Requirement #3.6.1-2	The Host Subsystem shall create transaction files (as described in A and B-1 of this TS-04 document); store; and send such files to the VDOT E-ZPass Customer Service Center.
TS-04 Requirement #3.6.1-3	The Host Subsystem shall receive violation initial disposition files (described in the Violation Interface in Appendix B-1 of this TS-04 document); store; and process such files.
TS-04 Requirement #3.6.1-4	The Host Subsystem shall process and store toll correction files and toll correction reconciliation files (described in Appendix B-2 of this TS-04 document).
TS-04 Requirement #3.6.1-5	The Host Subsystem shall process and store toll reconciliation response files (described Appendix B-3 of this TS-04 document).
TS-04 Requirement #3.6.1-6	The Host Subsystem shall transmit 100% of all E-ZPass Transaction records and all Image Transaction records to the VDOT E-ZPass CSC within 2 hours of when the respective vehicle passes the tolling point.
TS-04 Requirement #3.6.1-7	The Host Subsystem shall log all versions of the files sent to or received from the VDOT E-ZPass Customer Service Center and their time of receipt.
TS-04 Requirement #3.6.1-8	The Host Subsystem shall log and report all transmissions and attempted transmissions of files to the VDOT E-ZPass Customer Service Center.

Contract Criteria	
TS-04 Requirement #3.6.1-9	All files and other data exchanged between the Host Subsystem and the VDOT E-ZPass Customer Service Center shall be stored in a manner that makes it easy for an Authority user(s) to search for a file, locate it, display it, make a copy of it in .pdf file format, make a copy of it in .xlsx format, make a copy of it in .csv format, and email it in any of these formats.

The ORT Zone Subsystem and the Traditional Lane Subsystem will transmit violation image files directly to the VDOT E-ZPass Customer Service Center as described in the TS-05 document and the TS-06 document.

3.6.2. ORT Zone Subsystem

Contract Criteria	
TS-04 Requirement #3.6.2-1	All communications between the Host Subsystem and ORT Zone Subsystem (described in the TS-05 document) shall use guaranteed transmission protocols.
TS-04 Requirement #3.6.2-2	All communications between the Host Subsystem and the ORT Zone Subsystem shall be encrypted using a COTS software application (e.g. a Virtual Private Network) and such application shall be part of the Toll System.
TS-04 Requirement #3.6.2-3	The Host Subsystem shall contain all tools necessary for transponder status files to be automatically loaded onto portable media from the Host Subsystem, hand carried from the Host Subsystem location to each ORT Zone Subsystem location; automatically loaded onto the ORT Zone Subsystem; and placed into revenue service whenever the Authority's wide area network is unavailable.
TS-04 Requirement #3.6.2-4	The Host Subsystem shall contain all tools necessary for transaction records, violation records and violation image files to be automatically loaded from all zones of the ORT Zone Subsystem onto portable media, hand carried from the ORT Zone Subsystem location(s) to the Host Subsystem location; automatically loaded onto the Host Subsystem; and processed by the Host Subsystem whenever the Authority's wide area network is unavailable.

Other aspects of Host Subsystem communications with the ORT Zone Subsystem are detailed in sections 3.1 through 3.4 above, their respective subsections and the TS-05 document.

3.6.3. Traditional Lane Subsystem

Contract Criteria	
TS-04 Requirement #3.6.3-1	All communications between the Host Subsystem and Traditional Lane Subsystem (described in TS-06 document) shall use guaranteed transmission protocols.

Contract Criteria	
TS-04 Requirement #3.6.3-2	All communications between the Host Subsystem and the Traditional Lane Subsystem shall be encrypted using a COTS software application and such application shall be part of the Toll System.
TS-04 Requirement #3.6.3-3	The Host Subsystem shall receive from the Traditional Lane Subsystem, process and store all: • Supervisor logs • toll collection attendant logs • Segment of duty, shift and tour of duty data • Vault activity data • Gate incidents
TS-04 Requirement #3.6.3-4	The Host Subsystem shall contain all tools necessary for transponder status files to be automatically loaded onto portable media from the Host Subsystem, hand carried from the Host Subsystem location to each Traditional Lane Subsystem location; automatically loaded onto the Traditional Lane Subsystem and placed into revenue service in all lanes whenever the Authority's wide area network is unavailable.
TS-04 Requirement #3.6.3-5	The Host Subsystem shall contain all tools necessary for transaction records, violations records and violation image files to be automatically loaded from all lanes of the Traditional Lane Subsystem onto portable media, hand carried from the Traditional Lane Subsystem location(s) to the Host Subsystem location; automatically loaded onto the Host Subsystem; and processed by the Host Subsystem whenever the Authority's wide area network is unavailable.

Other requirements for communications with the Traditional Lane Subsystem are detailed in sections 3.1 through 3.4 above, their subsections and the TS-06 document.

3.7. UPS

The existing UPS in the Powhite Plaza South Administration Building is not considered part of the existing toll system. This existing UPS powers:

• The existing toll system host located in the same building

• The plaza elements of the existing toll system installed at the Powhite Parkway

• The traditional lane elements of one existing toll system installed there

• The ORT zone elements of the other existing toll system installed there.

• Other local Authority systems

• Other enterprise-level Authority systems

Contract Criteria	
TS-04 Requirement #3.7-1	The Contractor shall not disturb or otherwise affect the availability, operation or performance of this existing UPS, any other local Authority systems connected to it or any other enterprise-level Authority systems connected to it.
TS-04 Requirement #3.7-2	Except for those specific lanes or ORT zones where the Authority has authorized the Contractor to begin removal of existing toll system elements, the Contractor shall not disturb or otherwise affect the availability, operation or performance of existing toll system elements connected to this existing UPS.
TS-04 Requirement #3.7-3	The Contractor shall furnish and install an uninterruptible power supply (UPS) as part of the Host Subsystem such that it powers and protects all Host Subsystem elements.
TS-04 Requirement #3.7-4	The Host Subsystem's MOMS function shall log and issue an alert when a threshold of the UPS battery power has been reached and such threshold shall be configurable by an Authority user(s).
TS-04 Requirement #3.7-5	The Host Subsystem shall shut down gracefully when a threshold of the UPS battery power has been reached and such threshold shall be configurable by an Authority user(s).
TS-04 Requirement #3.7-6	After such shutdown, the Host Subsystem shall resume all operation without manual intervention when external power to the UPS is restored.

3.8. Storage

RAID storage requirements are described in section 3.5 above.

Contract Criteria	
TS-04 Requirement #3.8-1	The Host Subsystem shall automatically back up all its data daily without manual intervention using disk libraries and the archival parameters shall be configurable by an Authority user(s) for each type of data.
TS-04 Requirement #3.8-2	The Host Subsystem shall log, store and send an alert (see section 3.3.3) to notify an Authority user(s) of the status of such backup process.
TS-04 Requirement #3.8-3	The Host Subsystem shall provide for viewing the backup data in a user friendly and readable form.
TS-04 Requirement #3.8-4	The Host Subsystem shall provide for loading and unloading data manually in the event of a catastrophic failure of the Authority's WAN or other similar disaster.

Contract Criteria	
TS-04 Requirement #3.8-5	The Host Subsystem shall retain the following information on-line for twenty-four (24) months and then automatically archive it: a) All transaction records b) All toll rate tables c) All records described in subsections 3.2.1 through 3.2.7 above
TS-04 Requirement #3.8-6	The Host Subsystem shall retain the following information on-line for six (6) months and then automatically archive it: a) Digital Video Audit video with all transaction overlay data b) System logs
TS-04 Requirement #3.8-7	The Host Subsystem shall retain the following information on-line for ten (10) years and then automatically archive it: a) Summarized data, so that performance reports can be generated for trend analysis b) All MOMS data including but not limited to alarms, work orders, equipment inventory and maintenance activities
TS-04 Requirement #3.8-8	The Host Subsystem shall retain all other information on-line for eighteen (18) months and then automatically archive it.
TS-04 Requirement #3.8-9	The Host Subsystem shall automatically archive information onto permanent, long-term storage.
TS-04 Requirement #3.8-10	When the Host Subsystem storage utilization reaches 80% capacity, the Host Subsystem shall cause its MOMS function to log, store and send an alert.
TS-04 Requirement #3.8-11	After causing such an alert to be issued, the Host Subsystem shall archive data according to the business rules in the SDD document (see section 4 below and the TS-01 document).
TS-04 Requirement #3.8-12	After successful archival, the Host Subsystem shall automatically delete on-line data that has been archived and cause its MOMS function to log, store and send an alert confirming successful archival and deletion.
TS-04 Requirement #3.8-13	The Host Subsystem shall cause its MOMS function to log, store and send an alert if faults or errors are encountered in such archival, or a confirmation of successful archival is not created.
TS-04 Requirement #3.8-14	The Host Subsystem shall have sufficient capacity to accommodate the restoration of the archived data and provide for an Authority user(s) to generate queries from the restored data using the same tools and processes as are used to do the same with on-line data.
TS-04 Requirement #3.8-15	The Host Subsystem shall retain summarized data online for ten (10) years and then archive such data in a way that provides for performance reports to continue incorporating this data.

3.9. Screens

Contract Criteria	
TS-04 Requirement #3.9-1	The Host Subsystem shall provide screens displaying an operational and financial dashboard in data and pictorial format (i.e. "dashboard" screens) that show real time status of traffic, transactions and revenue. Such dashboard shall be role-driven and fully configurable to the extent that it allows each Authority user to customize their own dashboard.
TS-04 Requirement #3.9-2	The Host Subsystem shall provide near real-time monitoring of all activity at all locations in both a pictorial and dashboard view. This monitoring includes monitoring all equipment status; traffic and revenue monitoring; and monitoring of all maintenance activities in near real-time including but not limited to: a) Detailed transaction activity (configurable) on selected lanes to include AVI data, license plate images, and other configurable detailed transaction activity information at selected ORT Zone Subsystem and Traditional Lane Subsystem locations b) Configurable half hour and hourly traffic summary for each ORT Zone Subsystem location and each lane of the Traditional Lane Subsystem c) Automatic Coin Machine and ACM vault status d) Status information on all other Toll System elements
TS-04 Requirement #3.9-3	The Host Subsystem shall provide users with direct access to the detailed data directly from these pictorial and dashboard views.
TS-04 Requirement #3.9-4	The Host Subsystem shall provide the tools and functions necessary for an Authority user(s) to easily maneuver through screens and view data, and provide readily configurable colors and pictures to bring critical events to the user's attention.
TS-04 Requirement #3.9-5	The Host Subsystem shall provide screens for an Authority user(s) to view all vault manifests.
TS-04 Requirement #3.9-6	The Host Subsystem shall provide finance and budget screens that show the various transaction types and revenues for any month or other time period.
TS-04 Requirement #3.9-7	The Host Subsystem shall provide reporting screens for transactions and revenue by a lane or group of lanes; by a time or a range of times; by day or range of days; by week; by month; by quarter; and by year. Such screens shall show expected revenue and provide transaction and summary level information.
TS-04 Requirement #3.9-8	The Host Subsystem shall provide reporting screens on non-revenue transactions including but not limited to those occurring in maintenance mode, those involving non-revenue transponders and those occurring during special events by a lane or group of lanes, a time or a range of times, by day, by week, by month, by quarter and by year. Each such special event reporting screen shall show the transactions that occurred during this mode of operation, the event type, the paid amount and the expected toll revenue not collected.

Contract Criteria	
TS-04 Requirement #3.9-9	The Host Subsystem shall provide all screens and tools for an Authority user(s) to view all data transmitted to, manually entered into and generated by the Host Subsystem.
TS-04 Requirement #3.9-10	The Host Subsystem shall control user privileges for all such screens by user group and such control shall be easily reconfigurable by an Authority user(s).
TS-04 Requirement #3.9-11	The Host Subsystem data shall provide all screens and tools for an Authority user(s) to audit and reconcile the Host Subsystem with the revenue collected and payments made.
TS-04 Requirement #3.9-12	Such screens shall show the status of the Revenue Day and other relevant statuses that indicate items including but not limited to whether: a) All data has been obtained from all ORT zone locations b) All Trip Records have been transmitted to the VDOT E-ZPass Customer Service Center c) The time of the last Trip Record processed
TS-04 Requirement #3.9-13	The Host Subsystem shall provide all screens and tools for an Authority user(s) to select a presentation chart type from a variety of graphic styles at any time and display and screen data in such graphic style.
TS-04 Requirement #3.9-14	The Host Subsystem shall make separate screens available for all maintenance mode transactions and transactions generated during maintenance modes shall not be included in any revenue and traffic screens.
TS-04 Requirement #3.9-15	The Host Subsystem shall provide all screens and tools for an Authority user(s) to: a) Print screens using printers provided by others on the Authority's wide area network b) Save screens in the specified formats
TS-04 Requirement #3.9-16	The Host Subsystem shall provide for an Authority user(s): a) To immediately e-mail all data on a screen b) To immediately place all data into a file directory of computers provided by others on the Authority's wide area network c) With all screens and tools to securely set up and alter schedules by which the Host System automatically e-mails all data on any screen to others d) With all screens and tools to securely set up and alter schedules by which the Host System automatically places all data on any screen in specific file directories of computers provided by others on the Authority's wide area network
TS-04 Requirement #3.9-17	The Host Subsystem shall provide all screens and tools for an Authority user(s) to drill down from all screens to the next level of detail including but not limited to screen data and the display and review of license plate images and Digital Video Audit video.
TS-04 Requirement #3.9-18	The Host Subsystem shall provide all screens and tools for an Authority user(s) to securely view the contents of files that are received by the Host Subsystem and transmitted by the Host Subsystem in a readable format.

Contract Criteria	
TS-04 Requirement #3.9-19	If files are compressed or encrypted, the Host Subsystem shall provide the necessary software tools to view their contents.
TS-04 Requirement #3.9-20	When the contents of such file are displayed, the Host Subsystem shall provide for an Authority user(s) to save the contents as a .csv file and in Excel format.
TS-04 Requirement #3.9-21	The Host Subsystem shall provide all screens and tools for an Authority user(s) to easily identify issues/problems (traffic or equipment); access and view related issues/problems automatically identified by the Toll System; log or provide additional detail on each issue/problem; and transmit notification of same to maintenance personnel and other MOMS users.

3.10. Reports

Proposal Criteria
As part of their proposal, the Offeror shall detail the financial reporting functions of the proposed Host Subsystem.

Contract Criteria	
TS-04 Requirement #3.10-1	The Host Subsystem shall have efficient data storage, server design, and data summarization techniques such that, when no more than ten (10) Authority users are simultaneously accessing the system: • Hourly and daily reports take no more than two (2) seconds to generate • Monthly and annual reports take no more than thirty (30) seconds to generate.
TS-04 Requirement #3.10-2	Such hourly and daily reports shall include but are not limited to the: • Transponder file receipt and transmission report • Transaction data and violation image transmission report • Violation trend report • Data backup, archival and retention report • System exceptions report
TS-04 Requirement #3.10-3	The Host Subsystem shall provide for an Authority user(s) specify a lane or group of lanes when generating such hourly and daily reports.

Additional Host Subsystem reports requirements are detailed in section 3.3.9 above.

3.11. Ad Hoc Report Tool

Contract Criteria	
TS-04 Requirement #3.11-1	The Host Subsystem shall provide a COTS software tool fully integrated and indexed to all data contained in the Host Subsystem for an Authority user(s) to create and generate additional reports on a regular basis.
TS-04 Requirement #3.11-2	The Host Subsystem shall provide all screens and tools for an Authority user(s) to create and store report templates selectable and usable by all other users having comparable Toll System privileges and access rights.

Authority personnel have some training in Crystal Reports and a preference for its use as the ad hoc report tool.

4. SYSTEM DESIGN DOCUMENTATION

The Contractor shall evaluate the Authority's current operations, interaction with the current toll system and associated processes.   The Contractor shall then document the associated Host Subsystem business rules in the System Design Requirements document as described in Tolling Specification #01.

Contract Criteria	
TS-04 Requirement #4-1	The Contractor shall evaluate the Authority's user groups, privileges and access rights on the current toll system and areas of requested improvement to form the basis for a similar construct for the Toll System and document same in the System Design Requirements document (described in Tolling Specification #01). The Contractor shall develop these details subject to the Authority's approval and document same prior to the Midpoint Design Review Milestone.
TS-04 Requirement #4-2	The System Detailed Design (SDD) document shall describe how Toll System user groups, privileges and access rights are implemented.
TS-04 Requirement #4-3	The SDD document shall describe how single sign-on provides for a user to sign onto the Host Subsystem, ORT Zone Subsystem and Traditional Lane Subsystem and all of their functions including but not limited to the MOMS and Digital Video Audit functions.
TS-04 Requirement #4-4	The SDD document shall describe the strict controls of the Toll System administrator functions.
TS-04 Requirement #4-5	The Contractor shall evaluate the Authority's processing, reporting and auditing of the records (described in subsections 3.2.1 through 3.2.7 above) on the current toll system to fully document a similar construct for the Toll System in the System Design Requirements document (described in Tolling Specification #01

Contract Criteria	
TS-04 Requirement #4-6	The SDD document shall describe all Host Subsystem processing, reporting and audit functions related to the records described in subsections 3.2.1 through 3.2.7 above. The Contractor shall develop these details subject to the Authority's approval and document same prior to the Midpoint Design Review Milestone.
TS-04 Requirement #4-7	The SDD document shall describe and detail all Host Subsystem MOMS functions (in subsections 3.3.1 through 3.3.9 above) including but not limited to all associated screens and reports.
TS-04 Requirement #4-8	The SDD document shall describe all Host Subsystem Digital Video Audit functions described in section 3.4 above including but not limited to all associated screens, reports and data.
TS-04 Requirement #4-9	The SDD document shall detail all fault tolerance designed into the Host Subsystem.
TS-04 Requirement #4-10	The SDD document shall contain an Interface Control Document(s) detailing the full interface between the Host Subsystem, the ORT Zone Subsystem and the Traditional Lane Subsystem including but not limited to all MOMS communication and all Digital Video Audit communication.
TS-04 Requirement #4-11	The SDD document shall describe how the Host Subsystem logs all versions of the files sent to or received from the VDOT E-ZPass Customer Service Center (section 3.6.1 above) and the tools for an Authority user(s) to locate, view and copy the log timeframe of interest.
TS-04 Requirement #4-12	The SDD document shall detail all COTS hardware and COTS software in the Host Subsystem, all status information specified by the manufacturer for each and how this information is monitored by the Toll System.
TS-04 Requirement #4-13	The SDD document shall detail all hardware and software implementation of the storage function (section 3.8 above).
TS-04 Requirement #4-14	The SDD document shall detail all business rules for archival of data.
TS-04 Requirement #4-15	The SDD document shall detail the implementation of the screens functions (section 3.9 above) and how this will operate from each Host Subsystem location.
TS-04 Requirement #4-16	The SDD document shall detail the dashboard screen(s), subject to the Authority's approval.

Contract Criteria	
TS-04 Requirement #4-17	The SDD document shall detail printing from screen functions including adding, changing and deleting available printers (provided by others) and available file formats including but not limited to .pdf format; .html format; .xml format; .rtf format; Excel formats (MS Office 2007, .xlsx or latest version) and other commonly used formats identified by the Authority during development of the SDD document.
TS-04 Requirement #4-18	The SDD document shall detail all hardware and software implementation of the reports function (section 3.10 above).
TS-04 Requirement #4-19	The SDD document shall, subject to the Authority's approval, document the processing and content of hourly and daily reports described in section 3.10 above including but not limited to: a) Transponder file transmission report b) Traffic and revenue reports c) Violation trend report d) Data backup, archival and retention report e) System exceptions report
TS-04 Requirement #4-20	The SDD document shall detail all hardware and software implementation of the ad hoc reports function in section 3.11 above.
TS-04 Requirement #4-21	The SDD document shall detail all hardware and software implementation of all other Host Subsystem functions.

Other SDD requirements, including but not limited to database schema and reporting, are detailed in Tolling Specification #01.

5. HARDWARE AND INSTALLATION

Contract Criteria	
TS-04 Requirement #5-1	Re-use of any host element from the existing toll system is not allowed and the Contractor shall remove, scrap for zero value and dispose of all existing toll system equipment, cabling, exposed conduit, mounting hardware and enclosures at each of the locations described in section 2 above.
TS-04 Requirement #5-2	The Contractor shall furnish and install an enclosure(s) to house the entire Host Subsystem in the server room of the Powhite Parkway south plaza administration building

Contract Criteria	
TS-04 Requirement #5-3	The enclosure described above shall house the entire Host Subsystem; consist of one or more fully equipped computer cabinets typical of a data center environment; and include all computers, storage devices, network equipment, power strips, casters, front covers, side covers, rear covers, cover locks, equipment mounting rails and shelves, casters, fans, filters, other features and accessories.
TS-04 Requirement #5-4	The Contractor shall furnish and install all other hardware, associated mounting fixtures, cabling, and other items to form a fully functional Host Subsystem that meets all requirements specified in this TS-04 document and elsewhere in the Contract documents.

Additional requirements for hardware and installation are detailed in the TS-03 document.

6. INFRASTRUCTURE DOCUMENTATION

Contract Criteria	
TS-06 Requirement #6-1	The Detailed Design Drawings, Detailed Design Calculations, Detailed Design Specifications and Shop Drawings shall fully describe installation of the UPS at the Host Subsystem location.
TS-06 Requirement #6-2	The Detailed Design Drawings, Detailed Design Calculations, Detailed Design Specifications and Shop Drawings shall fully describe installation of all other Host Subsytem elements including but not limited to other equipment, conduit, mounting hardware and cabling.

TS-04: APPENDIX A

VDOT E-ZPASS (BLACK BOX) INTERFACE

Virginia Department of Transportation
E-ZPass Service Center
(Black Box)
Interface Specifications

Version 3.8 – FINAL

September 21, 2016

Revision History

Version #	Date	Change Description
Version 1.0	June 2006	Initial Release
Version 1.1	February 2007	Update to standard format
Version 2.0	May 2007	Revisions for CBBT
Version 2.1	August 2007	Grammatical revisions
Version 2.2	October 2008	3.3.4 corrected value for DST indicator
Version 3.0 – Draft	11/15/2010	Added Entry information to transaction; and converted document to Word format
Version 3.1 – DRAFT	11/18/2010	Add AVI_HOV_SWITCH_ON and status bits to tag file; add EXIT PLAZA/LANES to VSR_HEADER
Version 3.2 – DRAFT	5/2/2011	Corrected System Overview and Network Architecture section; small typos have been corrected per CBE comments; Added Appendix B – ICLP File Transfer; Added Appendix C – IITC File Transfer; Changed transfer method for transaction to use Web Service call with XML data format; added Tag Status Update File; updated Version number of AVI Status File
Version 3.3 – DRAFT	5/4/2011	Added sequence number to toll transaction; A note was

Version #	Date	Change Description
		added that all times are specific to the Eastern Time Zone.
Version 3.4 – DRAFT FINAL	5/19/2011	Removed PayMethod from transaction; added Pricing Date/Time field to transaction; add additional business rules; added unique identifier to Tag Status Update File
Version 3.5 – FINAL	5/27/2011	Revised tag status to show full tag status from file in effect at time of read; added tag file information; added business rule about tag status allowed to submit; added business rule regarding submittal of $0 transactions
Version 3.5.1 – FINAL	8/23/2011	Clarification of tags files sent to HOT Lanes will not contain Non-Revenue tags, except those in Hybrid accounts
Version 3.5.2 – FINAL	9/13/2011	Clarification of 'INVALID' tags in Tag File
Version 3.6 – FINAL	4/12/2012	Add better field definitions for the web services call to the Black Box
Version 3.7 - DRAFT	5/29/2014	-Toll Facilities not support Non-Revenue Tags need to support a internal Tag List -Backlog Transactions limited to 3 day limit

Version #	Date	Change Description
		-Non-Revenue and Hybrid not sent in ITGU files
3.8	9/21/2016	Declaration of the type of ENDIAN used in the Tag file

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1   Introduction

This document describes the interface between the Virginia Department of Transportation (VDOT) E-ZPass/Smart Tag Service Center and toll systems designed to operate in the VDOT AVI toll collection system. These interface specifications (refer to as the Black Box Interface) must be used by any toll system providers wishing to set up communications with the Service Center. Questions regarding this Service Center interface should be directed to the technical support group for the VDOT EZ-Pass Customer Service Center.

1.1   System Overview

The Service Center supports an interface for all AVI toll collection systems. This interface will allow for:
1) The submittal of AVI (tag) transactions for processing (See section 3)
2) The receipt of Tag Status Files from the Service Center for all IAG Agencies, including VDOT (in a format described in this document) (see Section 4)
3) The receipt of Tag Status Update Files from the Service Center for VDOT (in a format described in this document) (see Section 5)
4) The receipt of IAG Customer License Plate Files for all IAG Agencies, including VDOT (in the ICLP format provided in the existing IAG Specifications) (see Appendix B)
5) The receipt of IAG Invalid Tag Customer Files for all IAG Agencies, including VDOT (in the IITC format provided in the existing IAG Specifications) (see Appendix C)

1.1.1   Terminology

The term "Roadway Toll System" refers to the system that belongs to a roadway agency (or other entity) that collects toll information and will send the AVI transactions to the Customer Service Center. Only one point of contact will communicate from the Roadway Toll System to the Customer Service Center. There may be redundant hardware and redundant communications lines (depending on the implementation) but there will only be one communications path to manage the flow of transactions.

1.1.2   Time Zone

All Date/Time references in this specification are for the Eastern Time Zone of the United States, and will be reflective of Daylight/Non-Daylight Savings Time. No Date/Time zone conversions will be done by the Customer Service Center. All Date/Time references in the IAG Specifications are as described in their documentation.

2   Network Architecture

The Service Center communicates with each authorized toll system using TCP/IP. Any new toll system must also communicate with the Service Center Computers using TCP/IP.

2.1   Data From Service Center to Roadway Toll System

1) The service center sends complete tag status files periodically (upon receipt of incoming IAG Tag Status File from other IAG Agencies, or generation by VDOT for VDOT accounts). Tag status files are sent for the AVI Tags supported on the E-ZPass/Smart Tag Service Center (VDOT) and the other associated IAG Service Centers in other state locations. This file is sent to the Black Box and stored in the FTP file area for pickup by the roadway toll system.   The file contains the status of every tag registered at the service center. A file is provided for the tags for each IAG system (including VDOT). The format of this file is provided later in this document. The roadway toll system must be able to receive this file and send the data on to the lane controllers.

2) The service center sends a tag status update file periodically (every 15 minutes) which contains any tags that have had a status update in the previous 15-minute period. The format of this file is provided later in this document. It is delivered to the FTP file area for pickup by the roadway toll system.

3) The service center sends Customer License Plate Files (from VDOT and other IAG Agencies) upon receipt from the IAG Agencies (and generation by VDOT). The format of this file (ICLP) is provided in the IAG Inter-CSC Files Specification, Ver 1.51g. It is delivered to the FTP file area for pickup by the roadway toll system.

4) The service center sends Invalid Tag Customer Files (from VDOT and other IAG Agencies) upon receipt from the IAG Agencies (and generation by VDOT). The format of this file (IITC) is provided in the IAG Inter-CSC Files Specification, Ver 1.51g. It is delivered to the FTP file area for pickup by the roadway toll system.

2.1.1   Data from Roadway Toll System to Service Center

The Black Box Interface software is designed to process only one AVI transaction from the roadway toll system at a time. The AVI revenue transaction is processed by the Interface and logged for processing and forwarding to the Service Center. After the transaction has been logged into the Black Box, an acknowledgement (ACK) message to the roadway toll system software. The ACK message contains the timestamp and origination of the AVI transaction so the roadway toll system software can match the ACK message to the AVI transaction. The receipt of this ACK is the signal to the roadway toll system software to send another transaction to the interface. The formats of the AVI transaction and the associated ACK message are detailed later in this document.

3   Message Descriptions

All messages to and from the firewall are handled as XML messages that are transmitted through the use of a Restful Web Services call.

3.1   Interface to Submit AVI Transactions for Processing

URI: To submit new transactions:
     http://<ipaddress of Black Box Interface>:8080/Transactions/userObjs/
Method: POST
Media-Type: application/xml
Returned Response Code: 201 – Transaction Recorded; next transaction may be sent
                       412 – Precondition Failed – validation fail, returned 'error' xml
                       500 – Exception, connection error

3.2   Message Format

```
<?xml version="1.0" encoding="UTF-8"?>
<Transaction>
        <SourceSeqNo></SourceSeqNo>
        <TransactionType></TransactionType>
        <ExitDateTime></ExitDateTime>
        <ExitPlazaID></ExitPlazaID>
        <ExitLaneID></ExitLaneID>
        <ExitLaneSeqNo></ExitLaneSeqNo>
        <EntryDateTime></EntryDateTime>
        <EntryPlazaID></EntryPlazaID>
        <EntryLaneID></EntryLaneID>
        <EntryLaneSeqNo></EntryLaneSeqNo>
        <PricingDateTime></PricingDateTime>
        <PreClassForward></PreClassForward>
        <PreClassReverse></PreClassReverse>
        <ForwardAxles></ForwardAxles>
        <ReverseAxles></ReverseAxles>
        <TollAmount></TollAmount>
        <VehicleClass></VehicleClass>
        <NominationMethod></NominationMethod>
        <TagID></TagID>
        <TagRegion></TagRegion>
        <TagAuthority></TagAuthority>
        <TagStatus></TagStatus>
        <TagFileAgency></TagFileAgency>
        <TagFileDateTime></TagFileDateTime>
```

                     `<Switchable></Switchable>`
`</Transaction>`

3.2.1   Message Contents

The table below shows the contents of the message structure.

<div align="center">

Table 3-1 AVI Transaction Contents

</div>

Field	Description	Field Definition	Value
SourceSeqNo	This is the sequence number provided by the roadway toll system. It must be sequential and is used only for the transactions sent to the Service Center.	Bigint	> 0
TransactionType	This field is used to denote the type of transaction.	char	Toll transactions: B – Barrier C – Ticketed Complete X – Ticketed Unmatched Exit
ExitDateTime	Time of AVI tolling event in the lane ("Exit Time")	Varchar(28)	Formatted as YYYY-MM-DD HH:MM:SS
ExitPlazaID	The Plaza ID of the Exit Event	Smallint	Provided by the Roadway Toll System. Must match Plaza ID used by VDOT CSC.
ExitLaneID	The Lane ID of the Exit Event	Tinyint	Provided by the Roadway Toll System. Must match Lane ID used by VDOT CSC.
ExitLaneSeqNo	The Lane Sequence Number of the Transaction for the Exit Event	Int	Provided by the Roadway Toll System.
EntryDateTime	Time of AVI tolling event in the lane ("Entry Time")	Varchar(28)	Formatted as YYYY-MM-DD HH:MM:SS If Transaction Type = B, or X, then set this field to *

Field	Description	Field Definition	Value
EntryPlazaID	The Plaza ID of the Entry Event	Smallint	Provided by the Roadway Toll System. Must match Plaza ID used by VDOT CSC. If Transaction Type = B, or X, then set this field to *
EntryLaneID	The Lane ID of the Entry Event	Tinyint	Provided by the Roadway Toll System. Must match Lane ID used by VDOT CSC. If Transaction Type = B, or X, then set this field to *
EntryLaneSeqNo	The Lane Sequence Number of the Transaction for the Entry Event	Int	Provided by the Roadway Toll System. If Transaction Type = B, or X, then set this field to *
PricingDateTime	Date/Time used for pricing this transaction	Varchar(28)	Formatted as YYYY-MM-DD HH:MM:SS (optional)
PreClassForward	Preclass forward axle count	Smallint	Varies, default should be 0
PreClassReverse	Preclass reverse axle count	Smallint	Varies, default should be 0
ForwardAxles	Forward axle count	Smallint	Varies, default should be 0
ReverseAxles	Reverse axle count	Smallint	Varies, default should be 0
TollAmount	Toll amount in cents. As determined by lane/plaza processing. Amount to be charged to patron account by CSC.	Int	Varies
VehicleClass	Vehicle classification resulting from lane/plaza processing. Based on lane sensors, tag class, collector input, etc. according to business rules specific to the facility.	Tinyint	Valid vehicle classes for the facility (as determined by the roadway toll system)

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Field	Description	Field Definition	Value
NominationMethod	Nomination method code for AVI	Tinyint	0 = Normal AVI Transaction 1 = HOV AVI – Switchable Tag 2 = HOV AVI – HOV Nomination
TagID	Tag id. Supplied by lane, as read by the tag reader in the lane. The tag number here should be one of those present in the tag status file provided by the CSC.	Int	Varies
TagRegion	Tag region – supplied by lane, as read by tag reader. Normally zero	Int	0
TagAuthority	Issuing authority – supplied by lane, as read by tag reader. Typically IAG agency code	Smallint	Per IAG specs
TagStatus	Tag status, as known by lane/plaza system at time of transaction	Hex string	The tag status information from the tag status file in use (see section 4 for tag status format). For example: A tag that is low balance (001), revenue (0), discount bit not set (0), IAG bit not set (0), an internal tag (0), and an HOV tag (1) would be show in binary as follows: 0000000010000001 would be shown in the XML string in hex as: 0x0081
TagFileAgency	Facility ID from the Tag file containing this Tag Status	Varchar(5)	Per IAG specs (for example VDT is 010)

Field	Description	Field Definition	Value
TagFileDateTime	Date/Time of the Tag file containing this Tag Status	Varchar(28)	Formatted as YYYY-MM-DD HH:MM:SS
Switchable	HOV status of tag	Tinyint	0 = Normal; 1 = HOV selected

3.3 Field Definition Sizes

Data type	Range	Storage
bigint	-2^63 (-9,223,372,036,854,775,808) to 2^63-1 (9,223,372,036,854,775,807)	8 Bytes
int	-2^31 (-2,147,483,648) to 2^31-1 (2,147,483,647)	4 Bytes
smallint	-2^15 (-32,768) to 2^15-1 (32,767)	2 Bytes
Tinyint	0 to 255	1 Byte

3.4 Sample Message

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Transaction>
        <SourceSeqNo>12345</SourceSeqNo>
        <TransactionType>B</TransactionType>
        <ExitDateTime> 2011-05-02 23:59:59</ExitDateTime>
        <ExitPlazaID>145</ExitPlazaID>
        <ExitLaneID>12</ExitLaneID>
        <ExitLaneSeqNo>123456789</ExitLaneSeqNo>
        <EntryDateTime>*</EntryDateTime>
        <EntryPlazaID>*</EntryPlazaID>
        <EntryLaneID>*</EntryLaneID>
        <EntryLaneSeqNo>*</EntryLaneSeqNo>
        <PreClassForward>0</PreClassForward>
        <PreClassReverse>0</PreClassReverse>
        <ForwardAxles>2</ForwardAxles>
        <ReverseAxles>0</ReverseAxles>
        <TollAmount>99999</TollAmount>
        <VehicleClass>5</VehicleClass>
        <NominationMethod>0</NominationMethod>
        <TagID>123456789</TagID>
        <TagRegion>0</TagRegion>
        <TagAuthority>010</TagAuthority>
        <TagStatus>0x0081</TagStatus>
        <TagFileAgency>010</TagFileAgency>
        <TagFileDateTime>2011-05-27 10:00:01</TagFileDateTime>
```

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```
        <Switchable>0</Switchable>
</Transaction>
```

3.5   Other Messages

No other messages are provide through the Black Box Interface. All messaging is now performed through the use of the Web Service calls documented above.

3.5.1   Keep Alive

This message is no longer provided by the Black Box Interface.

3.5.2   UTC Time

It is expected that the Roadway Toll System will use the NTP time protocol to sync their servers to a timeserver provided either on their network or from the web. Time services will not be provided by the Black Box Interface.

3.6   Business Rules

1) Transactions compiled from trip data using multiple read points or gantries shall be classed as ticketed transactions (sent as TransactionType = C, ticketed complete). Only transactions that include at least one transponder read shall be sent to the Black Box. Trip transactions compiled from multiple reads that include license plate only reads at some gantries may be sent to the Black Box as long as the license plate has been positively correlated with the transponder number in at least one of the reads used to build the trip. I.e., the transaction may be sent to the Black Box as an AVI transaction if both the transponder and plate were read at one gantry and only the license plate was read at all other gantries on the trip. Transactions using other data to correlate license plates and transponders (such as the ICLP file) shall be sent as VToll transactions.
2) Transactions may be received up to 30 days after transaction date/time.
3) For purposes of validation against tag files, the exit date/time of the transaction will be used.
4) Transactions with a value of greater than $0 (> $0) may be submitted for tag status of VALID or LOW BALANCE (see the lowest 3 status bits in tag status – section 4).
5) Transactions with a value of $0 (= $0) may be submitted for tag status of VALID, LOW BALANCE, and NEGATIVE BALANCE (see the lowest 3 status bits in tag status – section 4).
6) Backlog transactions can be submitted to the CSC at a rate of 3 backlog days per one posting day or 6 transactions per transponder.

4   AVI Tag Status File Description

The AVI tag status files from the Service Center and the associated IAG agencies are created using the following naming convention:

>   AVI_<IAG #>_YYYYMMDDHHMMSS_DAT.ZIP

Where:
>   IAG # is the Issuing Authority number assigned by the IAG network
>   YYYYMMDDHHMMSS is the time stamp of the AVI tag status file

Please note that the Virginia E-ZPass/Smart Tag Service Center's IAG number is 10 and its files are delivered to the plazas in the same manner as the IAG tag status files, as AVI_010_<date>_DAT.ZIP. For example, the file AVI_004_20060906162301_DAT.ZIP is a zipped version of the AVI tag status file from IAG authority 4 at 9/6/2006 at 4:23:01 PM. Before the daily TAG status file is zipped, it is converted to binary using **little-endian** bit sequence.

4.1   AVI Tag Status File Structures and Definitions

The following describes the AVI tag status file structure.

[CHAR*3]	sFileId	("AVI")
[UCHAR]	ucVersion	
[ULONGWORD]	ulFileIdent	
[UCHAR]	ucFiller	
[UCHAR]	ucIssuingAuthority;	
[ULONGWORD]	ulFirstTagNumberSent;	
[ULONGWORD]	ulLastTagNumberSent;	
[ULONGWORD]	ulMaxTagNumberAllowed;	
[UWORD]	uwStatus (For uwFirstTagStatusSent)	
..	uwStatus for every tag between the first and the last tag	
[UWORD]	uwStatus (For ulLastTagNumberSent)	

In the AVI tag status file generated by the VDOT Service Center, record values are as follows:

Table 4-1 AVI File Format Descriptions

RECORD	VALUE
sFileId	'AVI'
ucVersion	2
ulFileIdent	Unique file identifier
ucFiller	Unused character (0)
ucIssuingAuthority	IAG authority number for all tags contained in file

RECORD	VALUE
ulFirstTagNumberSent	Starting tag number in file
ulLastTagNumberSent	Ending tag number in file
ulMaxTagNumberAllowed	Maximum Tag Number Allowed (Same as ulLastTagNumberSent)

uwStatus	Num uwStatus messages are sent
	Bitwise breakdown:<pre>0000000011111111
	-------------^^^ Status bits (see below)
	------------^--- Non Rev bit
	-----------^---- Discount bit (1=in Discount Plan)
	----------^----- IAG bit (1=EZPass Plus)
	---------^------ Internal(0)/External(1) bit
	--------^------- Regular(0)/Switchable(1) bit
	^^^^^^^^-------- Spare bits</pre>
	Status bits:
	  AVI_VALID_TAG 0x00
	  AVI_LOW_BALANCE_TAG 0x01
	  AVI_NEG_BALANCE_TAG 0x02
	  AVI_VERIFY_TAG 0x03
	  AVI_INVALID_TAG 0x04
	  AVI_STOLEN_TAG 0x05
	
	NOTE: The Internal/External and Regular/Switchable status bits are for transponders in VDOT accounts only.

Note: Tags files delivered to facilities that do not accept VDOT non-revenue (e.g. at time of writing: the Capital Beltway HOT Lanes (CBE), I-95 Express Lanes, South Norfolk Jordan Bridge(SNJB), and Elizabeth River Crossings(ERC)) will show VDOT-designated Non-Revenue tags as INVALID unless the tags are part of a Hybrid account that contains funding, where the status will correspond to the prepaid portion of the account using the normal status bits. These roadways should provide an internal Plate and Tag list for Non-Revenue customers.

Note 2: Tag files contain status information for a range of tags between the ulFirstTagNumberSent and ulLastTagNumberSent. Tags that have never been issued and/or do not exist, will be marked INVALID.

5 Tag Status Update File

5.1 File Type:

Variable length, LF delimited

5.2 File Name:

VDOT_YYYYMMDDHHMMSS.ITGU

Example: VDOT_19971201001015.ITGU

5.3 File Use:

The Tag Status Update File is created by the Customer Service Center to inform Roadway Toll System as to the updated status of particular new and/or existing tags associated with an account held by the VDOT EZPass CSC only. It is based on the file format used by the IAG, but has been modified slight to accommodate additional reporting used for the VDOT tags.

5.4 File Layout:

Tag Status Update File – Header Structure		
Field Name	**Type/Size**	**Description/Valid Values**
FILE_TYPE	CHAR(4)	ITGU
FROM_AGENCY_ID	CHAR(3)	Always '010'
FILE_DATE	CHAR(8)	Date file created. Format: YYYYMMDD
FILE_TIME	CHAR(6)	Time file created: Format: HHMMSS
FILE_ID	CHAR(16)	Unique File Identifier
RECORD_COUNT	CHAR(8)	Count of all tags in file. Does not include header record. Values: 00000000 – 99999999
DELIMITER	CHAR(1)	LF
Header Total	**46**	

Tag Status Update File - Detail Structure		
Field Name	**Type/Size**	**Description/Valid Values**
TAG_AGENCY_ID	CHAR(3)	Tag agency ID, always '010'
TAG_SERIAL_NUMBER	CHAR(8)	Tag serial number. Values: 00000001 – 16777215

Tag Status Update File - Detail Structure		
Field Name	**Type/Size**	**Description/Valid Values**

TAG_STATUS	CHAR(4)	A string of 16 bits (4 characters) converted to Hex-ASCII format (4 characters). The 16 bits represent the following:
		
		Bitwise breakdown:
		`0000000011111111`
		`-------------^^^ Status bits (see below)`
		`------------^--- Non Rev bit`
		`-----------^---- Discount bit (1=in Discount Plan)`
		`----------^----- IAG bit (1=EZPass Plus)`
		`---------^------ Internal(0)/External(1) bit`
		`--------^------- Regular(0)/Switchable(1) bit`
		`^^^^^^^^-------- Spare bits`
		
		Status bits:
		AVI_VALID_TAG 0x00
		AVI_LOW_BALANCE_TAG 0x01
		AVI_NEG_BALANCE_TAG 0x02
		AVI_VERIFY_TAG 0x03
		AVI_INVALID_TAG 0x04
		AVI_STOLEN_TAG 0x05
		
		NOTE: The Internal/External and Regular/Switchable status bits are for transponders in VDOT accounts only.

DELIMITER	CHAR(1)	LF
Record Total	**16**	

5.5 Processing Requirements:

1. This file is sent in differential format, which means that it includes all changes made since the last Tag Status Update File was sent.

2. Frequency of this file could be as often as every 15 minutes.

3. File size should be negligible since the file will primarily be used to inform the Roadway Toll Systems of updated tag information on an as needed basis.

4. ITGU files will not contain Non-Revenue or Hybrid accounts, to make them universal with all roadways.

5.6 File Transfer Requirements:

1. All files shall be compressed (ZIPped) using a standard Lempel-Zif compression algorithm that should yield a compression rate of at least 75% (meaning a file will be reduced so that it is only 25% of its original size).
2. When compressed, file names shall be converted from {FILE_NAME}.{FILE_TYPE} to {FILE_NAME}_{FILE_TYPE}.ZIP and all files names shall be created using uppercase characters only. Therefore, when file "R002_20061131004321_VTR.XML" is compressed, the compressed file shall be named "R002_20061131004321_VTR_XML.ZIP".

3. Files will be fully created, and zipped before being made available on the FTP server section of the Black Box interface.
4. The FTP space using this service is divided into 'IN' and 'OUT' subdirectories.
5. All files being delivered by the Roadway Toll System (when required) will be dropped off into the 'IN' subdirectory.
6. When transferring the .ZIP files to the FTP server, rename the extension from .ZIP to .ZAP before transferring the file. Then transfer the file to the FTP site. The .ZAP extension tells the receiving code that a file transfer is in progress and do not process this file.
7. When the file transfer has been completed, change the file extension back to .ZIP for the file just delivered to the FTP server. This lets the receiving code know that the file can now be processed.
8. The process described in 6) and 7) are also used by the CSC when delivering response files to the 'OUT' subdirectory. Never pick up a file with the .ZAP extension.
9. If a file has been delivered to the 'IN' subdirectory, and the receiving code determines that there is a problem between the header data and the contents of the file, the original file will have a .bad extension added to it, and will then be placed in the 'OUT' subdirectory.
10. The CSC receiving code will be responsible for keeping the 'IN' subdirectory cleaned out of all processed files.
11. The using Roadway Toll System is responsible for cleaning out the 'OUT' subdirectory after receiving the response and .bad files.

6   Appendix A - Glossary

AVI	Automatic Vehicle Identification
AVI Tag File	A file that describes the current status of the AVI Tags addressed by the Service Center.
AVI Transaction	A valid transaction using a valid VDOT/IAG transponder
Firewall/Black Box Interface	A combination of hardware and software designed to collect and store transactions from non-integrated toll facilities. The Service Center places the AVI Tag File in a public folder on the interface for retrieval by the non-integrated toll system.
IAG	InterAgency Group. A consortium of tolling agencies that cooperate to allow patrons to use their AVI tags on toll roads operated by its members. For more information, see their web site at http://www.e-zpass.info/index.htm
Plaza	When used alone, it refers to the hardware and software used at the main collection point in its entirety. For example, "plaza" in the sentence 'The "plaza" must communicate with the Service Center using TCP/IP.' refers to the hardware, software and networking at the main toll collection point. It is often used in combination with other descriptors such as "plaza software", "plaza hardware", "plaza communications", etc.
Service Center	The VDOT E-ZPass/Smart Tag Service Center where E-ZPass and Smart Tag transactions are debited from a patron's account and credited to the Toll Road's account. The E-ZPass/Smart Tag Service Center is also responsible for replenishing Smart Tag accounts and transmitting a list of valid tags to the Virginia Toll Roads and Away Agencies.
VDOT	Virginia Department of Transportation

7   Appendix B – Customer License Plate File (ICLP) Delivery

1) All files shall be compressed (ZIPped) using a standard Lempel-Zif compression algorithm which should yield a compression rate of at least 75% (meaning a file will be reduced so that it is only 25% of its original size).
2) When compressed, file names shall be converted from {FILE_NAME}.ICLP to {FILE_NAME}_ICLP.ZIP and all files names shall be created using uppercase characters only. Therefore, when file "R002_20061131004321_VTR.XML" is compressed, the compressed file shall be named "R002_20061131004321_VTR_XML.ZIP".
3) Files will be fully created, and zipped before being made available on the FTP server section of the Black Box interface.
4) The FTP space using this service is divided into 'IN' and 'OUT' subdirectories.
5) All files being delivered by the Roadway Toll System (when required) will be dropped off into the 'IN' subdirectory.
6) When transferring the .ZIP files to the FTP server, rename the extension from .ZIP to .ZAP before transferring the file. Then transfer the file to the FTP site. The .ZAP extension tells the receiving code that a file transfer is in progress and do not process this file.
7) When the file transfer has been completed, change the file extension back to .ZIP for the file just delivered to the FTP server. This lets the receiving code know that the file can now be processed.
8) The process described in 6) and 7) are also used by the CSC when delivering response files to the 'OUT' subdirectory. Never pick up a file with the .ZAP extension.
9) If a file has been delivered to the 'IN' subdirectory, and the receiving code determines that there is a problem between the header data and the contents of the file, the original file will have a .bad extension added to it, and will then be placed in the 'OUT' subdirectory.
10) The CSC receiving code will be responsible for keeping the 'IN' subdirectory cleaned out of all processed files.
11) The using Roadway Toll System is responsible for cleaning out the 'OUT' subdirectory after receiving the response and .bad files.

8 Appendix C – Invalid Tag Customer Information File (IITC) Delivery

1) All files shall be compressed (ZIPped) using a standard Lempel-Zif compression algorithm which should yield a compression rate of at least 75% (meaning a file will be reduced so that it is only 25% of its original size).
2) When compressed, file names shall be converted from {FILE_NAME}.IITC to {FILE_NAME}_IITC.ZIP and all files names shall be created using uppercase characters only. Therefore, when file "R002_20061131004321_VTR.XML" is compressed, the compressed file shall be named "R002_20061131004321_VTR_XML.ZIP".
3) Files will be fully created, and zipped before being made available on the FTP server section of the Black Box interface.
4) The FTP space using this service is divided into 'IN' and 'OUT' subdirectories.
5) All files being delivered by the Roadway Toll System (when required) will be dropped off into the 'IN' subdirectory.
6) When transferring the .ZIP files to the FTP server, rename the extension from .ZIP to .ZAP before transferring the file. Then transfer the file to the FTP site. The .ZAP extension tells the receiving code that a file transfer is in progress and do not process this file.
7) When the file transfer has been completed, change the file extension back to .ZIP for the file just delivered to the FTP server. This lets the receiving code know that the file can now be processed.
8) The process described in 6) and 7) are also used by the CSC when delivering response files to the 'OUT' subdirectory. Never pick up a file with the .ZAP extension.
9) If a file has been delivered to the 'IN' subdirectory, and the receiving code determines that there is a problem between the header data and the contents of the file, the original file will have a .bad extension added to it, and will then be placed in the 'OUT' subdirectory.
10) The CSC receiving code will be responsible for keeping the 'IN' subdirectory cleaned out of all processed files.
11) The using Roadway Toll System is responsible for cleaning out the 'OUT' subdirectory after receiving the response and .bad files.

TS-04: APPENDIX B-1

VDOT VIOLATION INTERFACE

Violation Interface

Virginia Toll Facilities Group – VDOT

Specifications

DRAFT

Version 1.6

September 29, 2016

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List of Tables

Revision Status

Date	Version Number	Responsible Party	Comments
3/1/2011	V1.0 – DRAFT	Federal Signal Technologies	Initial Draft
3/2/2011	V1.1 – DRAFT	Federal Signal Technologies	Initial Review comments incorporated
9/16/2011	V1.2 – FINAL	FSTech	Final Version
12/12/2011	V1.3 – FINAL	FSTech	Added Image Type (F = Front, R = Rear, I = Region of Interest) to Image File Name
3/6/2013	V1.4 - DRAFT	3M	Changed Facility Name to Mandatory and updated Appendix F with new roadways
9/21/2016	V1.5 – DRAFT	Faneuil	OCR level 101 for transactions reviewed before sending the transactions
9/29/2016	V1.6 – DRAFT	Faneuil	Added clarification on violation images sent

1   Introduction

The *Violation Interface – VTFG to VDOT - Specifications* document defines the formats for the files that shall be transmitted between the VTFG agencies and the VDOT Customer Service Center (CSC) to facilitate the processing of violations.

The interface files defined are:

File Name	File Usage
Violation Transaction File	Created by the VTFG agency to inform the CSC of all violation transactions that require processing at the CSC.
Violation Disposition File	Created by the CSC to inform the VTFG agency as to the disposition of violation transactions processed by the CSC that occurred at the VTFG agency's facilities.
Image File	Created by the VTFG agency to transmit the violation images to the CSC in support of the violation transactions provided in the violation transaction file (see above).

2   Violation Transaction File

2.1   Violation Transaction File Content

The following detail fields are included in Image File:

Unique sequence ID
Transaction Type
Entry Plaza Id
Entry Lane Id
Entry Date/Time
Entry Lane Sequence Number
Entry Lane Mode
Exit Plaza Id
Exit Lane Id
Exit Date/Time
Exit Lane Sequence Number
Exit Lane Mode
Image Available Flag
Number of Images for Transaction
Tag Serial Number
Tag Agency
Tag Status
Tag Class
License Plate Number
License State
License Plate Type
OCR Confidence for Plate Number
OCR Confidence for Plate State
OCR Confidence for Plate Type
PreClass Forward Axle Count
PreClass Reverse Axle Count
Forward Axle Count
Reverse Axle Count
Vehicle Classification
Unusual Occurrence Code
Expected Revenue amount
Collected Revenue amount
Processing Request

2.2   Violation Transaction File Naming

The Violation Transaction File is named according to the following convention:.

X[FacilityID]_[FileDateTime]_VTX.XML
X – Is the Violation Transaction File
FacilityID – Is the Facility ID
FileDateTime – Is the FileDateTime
VTX – Is the Violation Transaction file.

Example: For a Violation Transaction File created by Facility 002 at 00:43:21 on November 31, 2006, the name of the file would be X002_20061131004321_VTX.XML.

2.3   Violation Transaction File Layout

Violation Transaction File uses XML formatting as defined below.

```
<VTXFile_1.0>
        <Header          FacilityID=""
                         FacilityName=""
                         FileDateTime=""
                         TransactionCount=""
                         TransactionSum="" />
```

```
      <DetailData>
            <VTX          UniqueSequenceNo=""
                          TransactionType=""
                          EntryPlazaID=""
                          EntryLaneID= ""
                          EntryDateTime=""
                          EntryLaneSeqNo=""
                          EntryLaneMode=""
                          ExitPlazaID=""
                          ExitLaneID= ""
                          ExitDateTime=""
                          ExitLaneSeqNo=""
                          ExitLaneMode=""
                          ImageAvailable=""
                          NumberofImages=""
                          TagSerialNumber=""
                          TagAgency=""
                          TagStatus=""
                          TagClass=""
                          LicensePlateNumber=""
                          LicensePlateState=""
                          LicensePlateType=""
                          OCRConfPlateNum=""
                          OCRConfPlateState-""
                          OCRConfPlateType=""
                          PreClassForwardAxle=""
                          PreClassReverseAxle=""
                          ForwardAxle=""
                          ReverseAxle=""
                          VehicleClass=''
                          UOCode=""
                          ExpectedRevenue=""
                          CollectedRevenue=""
                          ProcessingRequest="" />
      …
      </DetailData>
      <Footer />
</VTXFile_1.0>
```

2.4   Violation Transaction File Data Elements

2.4.1   Top Level (Root) Tag

The file description used in the top-level xml tag will be <VTXFile_1.0> .

2.4.2   Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed in Table 2-1 are the data elements for the <Header> record in a Violation Transaction File.

Table 2-1 Data Elements for the <HEADER> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
FacilityID	Yes	UnsignedShort	Facility ID providing this data file. . Match to the number used by the VDOT CSC (see Appendix F)
FacilityName	Yes	string	Name of facility. Match to the name as used in the VDOT CSC (see Appendix F)
FileDateTime	Yes	dateTime	Date/Time this file was created. Formatted as YYYY-MM-DD HH:MM:SS

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
TransactionCount	Yes	unsignedLong	Number of Transaction records in the file.
TransactionSum	Yes	decimal	Total summation (of Expected Revenue) of all Transaction records in this file.

2.4.3   Detail Data

Each transaction record will be contained within a <VTX> record. Listed in Table 2-2 are the data elements for the <VTX> record.

Table 2-2 Data Elements for the <VTX> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
UniqueSequenceNo	Yes	unsignedLong	Unique sequence number of this transaction. This is assigned by the sending agency.
TransactionType	Yes	Char(1)	Type of Transaction B – Barrier C – Entry/Exit X – Unmatched Exit (Entry/Exit System)
EntryPlazaID	Yes	short	Entry Plaza Id of this transaction. Use * if Barrier or Unmatched Exit Must match Plaza ID used by VDOT CSC (see Appendix A)
EntryLaneID	Yes	short	Entry Lane Id of this transaction. Use * if Barrier or Unmatched Exit Must match Lane ID used by VDOT CSC (see Appendix B)
EntryDateTime	Yes	date	Entry Date and Time of this transaction. Use * if Barrier or Unmatched Exit Formatted as YYYY-MM-DD HH:MM:SS
EntryLaneSeqNo	Yes	unsignedLong	Entry Lane Sequence Number of this transaction Use * if Barrier or Unmatched Exit
EntryLaneMode	Yes	Short	Entry Lane Mode of this transaction

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			Use * if Barrier or Unmatched Exit Must match Lane Mode types used by VDOT CSC (see Appendix C)
ExitPlazaID	Yes	short	Exit Plaza Id of this transaction. Must match Plaza ID used by VDOT CSC (See Appendix A)
ExitLaneID	Yes	short	Exit Lane Id of this transaction. Must match Lane ID used by VDOT CSC (see Appendix B)
ExitDateTime	Yes	date	Exit Date and Time of this transaction Formatted as YYYY-MM-DD HH:MM:SS
ExitLaneSeqNo	Yes	unsignedLong	Exit Lane Sequence Number of this transaction This is the Lane Sequence Number used to label the violation image files
ExitLaneMode	Yes	Short	Exit Lane Mode of this transaction Must match Lane Mode types used by VDOT CSC (see Appendix C)
ImageAvailable	Yes	Char(1)	Y if image is available from sending agency; N if image is not available from sending agency
NumberofImages	Yes	Short	Number of Images to be sent with this violation
TagSerialNumber	Yes	unsignedLong	Tag Number of this transaction. Use * if no tag number is available
TagAgency	Yes	short	Tag Agency ID of this transaction. Use * if no tag agency is available
TagStatus	Yes	short	Tag status, as known by the lane/plaza at this time of the transaction Use * if no tag status is available
TagClass	Yes	Short	Tag class read at the time of this transaction

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			Use * if no tag class is available
LicensePlateNumber	Yes	String	License Plate Number of this transaction (left justified) Use * if no plate number is available
LicensePlateState	Yes	Char(2)	License Plate State of this transaction. Use * if no plate state is available
LicensePlateType	Yes	String	License Plate Type of this transaction Use * if no plate type is available Must match the License Plate Type used by the VDOT CSC (see Appendix D)
OCRConfPlateNum	Yes	Short	OCR Confidence Level of License Plate Number 00 to 101 Use 0 if not available For roadways doing image review before sending them to the CSC, use value 101
OCRConfPlateState	Yes	Short	OCR Confidence Level of License Plate State 00 to 101 Use 0 if not available For roadways doing image review before sending them to the CSC, use value 101
OCRConfPlateType	Yes	Short	OCR Confidence Level of License Plate Type 00 to 101 Use 0 if not available For roadways doing image review before sending them to the CSC, use value 101
PreClassForwardAxle	No	short	Preclassification Forward Axle count
PreClassReverseAxle	No	short	Preclassification Reverse Axle count
ForwardAxle	No	short	Forward Axle count
ReverseAxle	No	short	Reverse Axle count
VehicleClass	Yes	short	Vehicle Classification from lane/plaza processing. Based on lane sensors, tag class,

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			collector input, etc. according to business rules specific to the facility.
UOCode	Yes	Short	Unusual Occurrence Code Must match code used by the VDOT CSC (see Appendix E)
ExpectedRevenue	Yes	decimal	Transaction Amount to be Collected
CollectedRevenue	Yes	Decimal	Any amount that may have already been collected on this transaction (i.e. partial pay)
ProcessingRequest	Yes	Short	Processing Request for this violation 1 = VTOLL Only 2 = Full Notice Processing

2.4.4   Footer

Each file will contain a footer record with no required data elements.

3   Violation Initial Disposition File

3.1   Violation Initial Disposition File Content

The following detail fields are included in Violation Initial Disposition File:

Unique sequence ID
TransSeqID
Posting Date
Initial Disposition status

3.2   Violation Disposition File Naming

The Violation Disposition File is named according to the following convention:.

D[FacilityID]_[FileDateTime]_VDF.XML
D – Is the Violation Initial Disposition File
FacilityID – Is the Facility ID of the original transaction file
FileDateTime – Is the FileDateTime of the original transaction file
VDF – Is the violation initial disposition file.

Example: For a Violation Initial Disposition File created to respond to Facility 002 at 00:43:21 on November 31, 2006, the name of the file would be D002_20061131004321_VDF.XML.

3.3   Violation Initial Disposition File Layout

Violation Initial Disposition File uses XML formatting as defined below.

```
<ViolationDispositionFile_1.0>
        <Header          FacilityID=""
                         FacilityName=""
                         FileDateTime=""
                         TransactionCount="" />
        <DetailData>
                <ViolationDisposition          UniqueSequenceNo=""
                                               TransSeqID=""
                                               PostingDate=''
                                               InitialDispositionStatus="" />
        …
        </DetailData>
        <Footer />
</ViolationDispositionFile_1.0>
```

3.4   Violation Initial Disposition File Data Elements

3.4.1   Top Level (Root) Tag

The file description used in the top-level xml tag will be <ViolationDispositionFile_1.0> .

3.4.2   Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed in Table 3-1 are the data elements for the <Header> record in a Violation Initial Disposition File.

Table 3-1 Data Elements for the <HEADER> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
FacilityID	Yes	UnsignedShort	Facility ID from the original Transaction File. Match to the number used by the VDOT CSC (see Appendix F)

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
FacilityName	No	string	Name of facility to which dispositions will be sent. Match to the name as used in the VDOT CSC (see Appendix F)
FileDateTime	Yes	dateTime	Date/Time of this file. Formatted as YYYY-MM-DD HH:MM:SS
TransactionCount	Yes	unsignedLong	Number of Transaction records in the file.

3.4.3   Detail Data

Each transaction record will be contained within a <ViolationDisposition> record. Listed in Table 3-2 are the data elements for the <ViolationDisposition> record.

Table 3-2 Data Elements for the <VIOLATIONDISPOSITION> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
UniqueSequenceNo	Yes	unsignedLong	Unique sequence number of this transaction. This is assigned by the sending agency.
TransSeqID	Yes	unsignedLong	TransactionSeqID assigned by the CSC.
PostingDate	Yes	int	TransPostingDate assigned by the CSC. Formatted as YYYYMMDD
InitialDispositionStatus	Yes	String	V – violation transaction accepted for processing. T – invalid date/time (in the future) P – Invalid Plaza and/or Lane D – Duplicate U – Invalid UO Code X – Reject (other reason) Z – Zero Dollar Expected Revenue

3.4.4   Footer
Each file will contain a footer record with no required data elements.

4   Image File

4.1   Image File

The images associated with a violation transaction (provided in a violation transaction file) will be transmitted by FTP. These images will be individually encrypted using a PGP key set, and named in accordance with Section 4.2 below.

All images shall be labeled to match the Facility ID, Exit Plaza, Exit Lane, ExitDateTime and the Exit Lane Sequence Number provided in the violation transaction. Only one set of images from the referenced plaza location shall be transmitted.

All images shall be FTP'd BEFORE the corresponding violation transaction has been transmitted.

All images will be in JPEG format.

4.2   Image File Naming

The Image File is named according to the following convention (before encryption):.

I[FacilityID]_[Plaza]_[Lane]_[ExitDateTime]_[LaneSeqNo]_[ImageType]_[ImageNo].JPG
I – Is the Image File
FacilityID – Is the Facility ID
Plaza – is the Exit Plaza ID
Lane – is the Exit Lane ID
ExitDateTime – Is the Exit Date and Time of the Violation Transaction
LaneSeqNo –Exit Lane Sequence Number of the Violation Transaction
ImageType – F for Front, R for Rear, I for ROI (Region of Interest)
JPG – Is the JPEG Image file.

Example: For a Image File created by Facility 002 at 00:43:21 on November 31, 2006 for Plaza 1, Lane 12, Lane Sequence No 1000, Image 2 in sequence and a Front Camera, the name of the file would be I002_!_12_20061131004321_1000_2.JPG. Once encrypted, the file will have a .PGP extension on it.

5   General File Requirements

1) All transaction files (violation transactions and violation initial disposition) shall be compressed (ZIPped) using a standard Lempel-Zif compression algorithm which should yield a compression rate of at least 75% (meaning a file will be reduced so that it is only 25% of its original size). NO passwords should be used on the files.
2) When compressed, file names shall be converted from {FILE_NAME}.{FILE_TYPE} to {FILE_NAME}_{FILE_TYPE}.ZIP and all files names shall be created using uppercase characters only. Therefore, when file "R002_20061131004321_VTR.XML" is compressed, the compressed file shall be named "R002_20061131004321_VTR_XML.ZIP".
3) Files will be fully created, and zipped before being made available on an FTP server.
4) The FTP account space for each agency using this service is divided into 'IN' and 'OUT' subdirectories.
5) All files being delivered by the using Agency will be dropped off into the 'IN' subdirectory.
6) When transferring the .ZIP files to the FTP server, rename the extension from .ZIP to .ZAP before transferring the file. Then transfer the file to the FTP site. The .ZAP extension tells the receiving code that a file transfer is in progress and do not process this file.
7) When the file transfer has been completed, change the file extension back to .ZIP for the file just delivered to the FTP server. This lets the receiving code know that the file can now be processed.
8) The process described in 6) and 7) are also used by the CSC when delivering response files to the 'OUT' subdirectory. Never pick up a file with the .ZAP extension.
9) If a file has been delivered to the 'IN' subdirectory, and the receiving code determines that there is a problem between the header data and the contents of the file, the original file will have a .bad extension added to it, and will then be placed in the 'OUT' subdirectory.
10) The CSC receiving code will be responsible for keeping the 'IN' subdirectory cleaned out of all processed files.
11) The using Agency is responsible for cleaning out the 'OUT' subdirectory after receiving the response and .bad files.

6   Appendix A – Plaza ID

PlazaID	PlazaName	PlazaShortName	FacilityID
16	CHESAPEAKE, SOUTH	016	6
17	CHESAPEAKE, NORTH	017	6
18	CHESAPEAKE, DISC	018	6
42	MLT EAST	042	7
43	EXPRESS LANES EAST	043	7
44	EXPRESS LANES WEST	044	7
45	MLT WEST	045	7
46	LABURNUM AVENUE ENTRY RAMP	046	7
47	LABURNUM AVENUE EXIT RAMP	047	7
48	AIRPORT EXIT	048	7
49	AIRPORT ENTR	049	7
52	GLOUCESTER N	052	3
61	SULLY RD, SOUTH	061	2
63	SULLY RD, WEST	063	2
64	SULLY RD, EAST	064	2
65	CENTREVIL, WEST	065	2
66	CENTREVIL, EAST	066	2
67	FAIRFAX PK, WEST	067	2
68	FAIRFAX PK, EAST	068	2
69	RESTON PK, WEST	069	2
70	RESTON PK, EAST	070	2
71	WIEHLE AV, WEST	071	2
72	WIEHLE AV, EAST	072	2
73	HUNTER ML, WEST	073	2
74	HUNTER ML, EAST	074	2
75	MAIN LINE, ALT	075	2
76	ROUTE 7, EAST	076	2
77	MAIN LINE, WEST	077	2
78	MAIN LINE, EAST	078	2
79	SPRING HL, WEST	079	2
80	SPRING HL, EAST	080	2
81	CAPITAL, WEST	081	2
82	CAPITAL, EAST	082	2
91	MAINLINE	091	4
92	COURTHOUSE 653	092	4
93	MIDLOTHIAN 60	093	4
94	MAINLINE RAMPS	094	4
101	GREENWAY (M) EAST	101	1
102	RT 606, WEST	102	1
103	RT 606, EAST	103	1
104	RT 772, WEST	104	1
105	RT 772, EAST	105	1
106	CLAIBORNE, WEST	106	1
107	CLAIBORNE, EAST	107	1
108	RT 659, WEST	108	1
109	RT 659, EAST	109	1
110	RT 607, WEST	110	1
111	RT 607, EAST	111	1
112	SHREVE MILL RD, WEST	112	1
113	SHREVE MILL RD, EAST	113	1
118	GREENWAY (M) WEST	118	1
120	GREENWAY, DISC	120	1
121	RMA POWHITE N	PWN	5
122	RMA POWHITE S	PWS	5

PlazaID	PlazaName	PlazaShortName	FacilityID
123	FOREST HILL N	FHN	5
124	FOREST HILL S	FHS	5
125	DOUGLASDALE N	DGN	5
126	DOUGLASDALE S	DGS	5
127	POWHITE NORTH OPENROAD	PNO	5
128	POWHITE SOUTH OPENROAD	PSO	5
131	DTE MAIN E	DTE	5
132	DTE MAIN W	DTW	5
133	2D ST E	2SE	5
134	2D ST W	2SW	5
135	11TH ST E	11E	5
136	11TH ST W	11W	5
137	BLVD BRDG N	BLN	5
138	BLVD BRDG S	BLS	5
170	CBBT	CBS	8
171	CBBT	CBN	8

7   Appendix B – Lane ID

PlazaID	LaneNo
16	1
16	2
16	3
16	4
17	5
17	6
17	7
17	8
18	1
42	1
42	2
42	3
43	5
43	6
44	7
44	8
45	9
45	10
45	11
45	12
46	13
47	14
52	0
52	1
52	2
52	3
52	4
52	5
52	11
52	12
52	13
61	1
61	2
63	1
63	2
63	3
64	1
64	2
64	3
64	4
65	1
65	2
66	1
66	2
67	1
67	2
67	3
68	1
68	2
69	1
69	2
70	1
70	2
71	1

PlazaID	LaneNo
71	2
72	1
72	2
73	1
73	2
74	1
74	2
75	1
76	1
76	2
77	0
77	1
77	2
77	3
77	4
77	5
77	6
77	7
78	1
78	2
78	3
78	4
78	5
78	6
78	7
79	1
79	2
79	3
80	1
80	2
80	3
81	1
81	2
81	3
82	1
82	2
82	3
91	0
91	1
91	2
91	3
91	4
91	5
91	6
91	7
91	8
91	9
91	10
92	21
92	22
92	23
92	24
92	25
92	26
93	31
93	32

PlazaID	LaneNo
93	33
93	34
93	35
93	36
93	37
93	38
94	41
94	42
94	43
94	44
101	1
101	2
101	3
101	4
101	5
101	6
101	7
101	8
101	9
101	10
101	11
101	12
101	13
101	14
101	15
101	16
101	17
101	18
101	38
101	39
101	40
101	41
102	1
102	2
102	3
102	4
103	1
103	2
103	3
103	4
104	1
104	2
105	1
105	2
106	1
106	2
107	1
107	2
108	1
108	2
109	1
109	2
110	1
110	2
111	1
111	2

PlazaID	LaneNo
112	1
112	2
113	1
113	2
118	1
118	2
118	3
118	4
118	5
118	6
118	7
118	8
118	9
118	40
118	41
120	1
121	0
121	1
121	2
121	3
121	4
121	5
121	6
121	7
121	8
121	9
121	10
121	11
121	12
121	13
121	14
121	96
121	97
121	98
122	1
122	2
122	3
122	4
122	5
122	6
122	7
122	8
123	1
123	2
123	3
123	4
123	15
123	17
123	19
123	21
124	1
124	2
124	3
124	4
124	16
124	18

PlazaID	LaneNo
124	20
124	22
125	1
125	23
126	1
126	25
127	90
127	91
127	92
128	93
128	94
128	95
131	1
131	2
131	3
131	4
131	5
131	6
131	7
131	8
131	53
131	54
131	55
131	56
131	80
131	81
131	82
131	83
132	1
132	2
132	3
132	4
132	5
132	6
132	7
132	8
132	45
132	46
132	47
132	48
132	49
132	50
132	51
132	52
133	1
133	61
134	1
134	62
135	1
135	2
135	71
135	73
136	1
136	2
136	72
136	74

PlazaID	LaneNo
137	1
137	2
137	3
137	34
137	35
137	36
138	1
138	2
138	3
138	31
138	32
138	33
170	2
170	4
170	6
170	8
170	10
171	1
171	3
171	5
171	7
171	9

8   Appendix C – Lane Mode

LaneModeID	LaneMode
0	SHUTDOWN
1	STARTUP
2	CLOSED
3	DISABLED
4	MLT
5	MLT/ACM
6	MLT/E-ZPass
7	ACM
8	ACM/E-ZPass
9	E-ZPass
10	MLT/ACM/E-ZPass
11	STANDBY
12	DIAGNOSTIC
13	SPECIAL EVENTS
14	INACTIVE
15	CCS/E-ZPass
16	CCS
17	GWVDOT_REVENUE
18	GRNWY_REVENUE
19	MAX_MODE

9   Appendix D – License Plate Type

PLATE_TYPE_CODE	JURISDICTION_CODE	DESCRIPTION
NORMAL	AB	Default plate type: AB
NORMAL	AK	Default plate type: AK
NORMAL	AL	Default plate type: AL
NORMAL	AR	Default plate type: AR
NORMAL	AZ	Default plate type: AZ
NORMAL	BC	Default plate type: BC
NORMAL	CA	Default plate type: CA
NORMAL	CO	Default plate type: CO
NORMAL	CT	Default plate type: CT
NORMAL	DC	Default plate type: DC
NORMAL	DE	Default plate type: DE
NORMAL	FL	Default plate type: FL
NORMAL	GA	Default plate type: GA
NORMAL	HI	Default plate type: HI
NORMAL	IA	Default plate type: IA
NORMAL	ID	Default plate type: ID
NORMAL	IL	Default plate type: IL
NORMAL	IN	Default plate type: IN
NORMAL	KS	Default plate type: KS
NORMAL	KY	Default plate type: KY
NORMAL	LA	Default plate type: LA
NORMAL	MA	Default plate type: MA
NORMAL	MB	Default plate type: MB
NORMAL	MD	Default plate type: MD
NORMAL	ME	Default plate type: ME
NORMAL	MI	Default plate type: MI
NORMAL	MN	Default plate type: MN
NORMAL	MO	Default plate type: MO
NORMAL	MS	Default plate type: MS
NORMAL	MT	Default plate type: MT
NORMAL	NB	Default plate type: NB
NORMAL	NC	Default plate type: NC
NORMAL	ND	Default plate type: ND
NORMAL	NE	Default plate type: NE
NORMAL	NF	Default plate type: NF
NORMAL	NH	Default plate type: NH
NORMAL	NJ	Default plate type: NJ
NORMAL	NM	Default plate type: NM
NORMAL	NS	Default plate type: NS
NORMAL	NV	Default plate type: NV
NORMAL	NW	Default plate type: NW
NORMAL	NY	Default plate type: NY
NORMAL	OH	Default plate type: OH
NORMAL	OK	Default plate type: OK
NORMAL	ON	Default plate type: ON
NORMAL	OR	Default plate type: OR
NORMAL	PA	Default plate type: PA
NORMAL	PE	Default plate type: PE
NORMAL	PQ	Default plate type: PQ
NORMAL	PR	Default plate type: PR
NORMAL	RI	Default plate type: RI
NORMAL	SC	Default plate type: SC
NORMAL	SD	Default plate type: SD
NORMAL	SK	Default plate type: SK

PLATE_TYPE_CODE	JURISDICTION_CODE	DESCRIPTION
NORMAL	TN	Default plate type: TN
NORMAL	TX	Default plate type: TX
NORMAL	UT	Default plate type: UT
NORMAL	VT	Default plate type: VT
NORMAL	WA	Default plate type: WA
NORMAL	WI	Default plate type: WI
NORMAL	WV	Default plate type: WV
NORMAL	WY	Default plate type: WY
NORMAL	YK	Default plate type: YK
NON	VA	Other plate type: VA
TRE	VA	Treasurers: VA
GR	VA	General Registrar: VA
SH	VA	Sheriff: VA
CCC	VA	Circuit Court Clerks: VA
CA	VA	Commonwealth Attorneys: VA
COR	VA	Commissioners of Revenue: VA
AG	VA	Attorney General
AV	VA	Antique (black/white): VA
BI	VA	Bicentennial: VA
GS	VA	Great Seal: VA
HP	VA	Handicap (blue/white): VA
HTHP	VA	Heritage Handicap: VA
MC	VA	Motorcycle (blue/white): VA
MU	VA	Multi Use (paper tag): VA
NG	VA	National Guard: VA
NGR	VA	National Guard Retiree: VA
PA	VA	Passenger (blue/white): VA
SNHP	VA	Scenic Handicap: VA
TERMC	VA	Fight Terrorism Motorcycle: VA
AB	VA	173rd Airborne: VA
CIO	VA	AFL-CIO: VA
CIOHP	VA	AFL-CIO: (DIS) VA
AFC	VA	Air Force Cross: VA
AFCHP	VA	Air Force Cross: (DIS) VA
AFR	VA	Air Force Reserve: VA
ALPHA	VA	Alpha Kappa Alpha Sorority: VA
HAM	VA	Amateur Radio: VA
HAMHP	VA	Amateur Radio: (DIS) VA
AFS	VA	Animal Friendly: VA
AFSHP	VA	Animal Friendly: (DIS) VA
AQ	VA	Antique Veh-Yellow Bkground: VA
ASU	VA	Appalachian State University: VA
AR	VA	Army Reserve: VA
RE	VA	Association of Realtors: VA
REHP	VA	Association of Realtors: (DIS) VA
AUB	VA	Auburn University: VA
AUBHP	VA	Auburn University: (DIS) VA
AVU	VA	Averett University: VA
AE	VA	Aviation Enthusiasts: VA
AEHP	VA	Aviation Enthusiasts: (DIS) VA
BIKW	VA	Bicycle Enthusiasts: VA
BRCC	VA	Blue Ridge Community College: VA
BF	VA	Bluefield College: VA
BOAT	VA	Boat US: VA
BW	VA	Bowler: VA
BWHP	VA	Bowler: (DIS) VA

PLATE_TYPE_CODE	JURISDICTION_CODE	DESCRIPTION
VBCF	VA	Breast Cancer Foundation-VA: VA
BCHP	VA	Breast Cancer Foundation-VA: (DIS) VA
BC	VA	Bridgewater College: VA
BZ	VA	Bronze Star: VA
BZHP	VA	Bronze Star: (DIS) VA
BZV	VA	Bronze Star Valor: VA
FLY	VA	Butterfly Heritage: VA
FLYHP	VA	Butterfly Heritage: (DIS) VA
CB	VA	Chesapeake Bay: VA
CBHP	VA	Chesapeake Bay: (DIS) VA
CAKE	VA	Chesapeake City: VA
CAKHP	VA	Chesapeake City: (DIS) VA
CRS	VA	Chosin Reservoir Survivor: VA
CRSHP	VA	Chosin Reservoir Survivor: (DIS) VA
CNC	VA	Christopher Newport University: VA
CU	VA	Citadel University: VA
CAP	VA	Civil Air Patrol: VA
JLOC	VA	Class J No. 611 Steam Locomotv: VA
CFP	VA	Clean Special Fuel: VA
CFHP	VA	Clean Special Fuel: (DIS) VA
CGA	VA	Coast Guard Auxilary: VA
CGAHP	VA	Coast Guard Auxilary: (DIS) VA
CGR	VA	Coast Guard Reserve: VA
WM	VA	College of William & Mary: VA
WMHP	VA	College of William & Mary: (DIS) VA
CINF	VA	Combat Infantryman: VA
CIBHP	VA	Combat Infantryman: (DIS) VA
CC	VA	Commonwealth College: VA
SCU	VA	Credit Unions: VA
SCUHP	VA	Credit Unions: (DIS) VA
DSL	VA	Dabney S Lancaster Com College: VA
DCC	VA	Danville Community College: VA
DST	VA	Delta Sigma Theta Sorority: VA
DSTHP	VA	Delta Sigma Theta Sorority: (DIS) VA
JVD	VA	Diabetes: VA
DV	VA	Disabled Veteran: VA
DVI	VA	Disabled Veteran: (DIS) VA
DFC	VA	Distinguished Flying Cross: VA
DFCHP	VA	Distinguished Flying Cross: (DIS) VA
DSC	VA	Distinguished Service Cross: VA
DSCHP	VA	Distinguished Service Cross: (DIS) VA
TSP	VA	Drive Smart: VA
TSPHP	VA	Drive Smart: (DIS) VA
DU	VA	Ducks Unlimited: VA
DUHP	VA	Ducks Unlimited: (DIS) VA
DUKE	VA	Duke University: VA
DUKHP	VA	Duke University: (DIS) VA
EMCS	VA	Eastern Mennonite University: VA
VES	VA	Eastern Shore: VA
VESHP	VA	Eastern Shore: (DIS) VA
EVMS2	VA	Eastern Virginia Med School: VA
ELON	VA	Elon College: VA
EHC	VA	Emory & Henry College: VA
FX	VA	Fairfax City: VA
FXHP	VA	Fairfax City: (DIS) VA
SCHA	VA	Family/Children Fund - Hand: VA

PLATE_TYPE_CODE	JURISDICTION_CODE	DESCRIPTION
HEHP	VA	Family/Children Fund - Hand: (DIS) VA
SCHE	VA	Family/Children Fund - Heart: VA
SCST	VA	Family/Children Fund - Star: VA
SCKF	VA	Family/Children Fund-Kids 1st: VA
KFHP	VA	Family/Children Fund-Kids 1st: (DIS) VA
FC	VA	Ferrum College: VA
TERRM	VA	Fight Terrorism: VA
FD	VA	Firefighter (volunteer): VA
FDHP	VA	Firefighter (volunteer): (DIS) VA
FS	VA	Florida State University: VA
POW	VA	Former Prisoner of War: VA
POWHP	VA	Former Prisoner of War: (DIS) VA
FOX	VA	Fox Hunting License Plate: VA
FOP	VA	Fraternal Order of Police: VA
FOPHP	VA	Fraternal Order of Police: (DIS) VA
FM	VA	Freemason: VA
FMHP	VA	Freemason: (DIS) VA
TIBET	VA	Friends of Tibet: VA
TIBHP	VA	Friends of Tibet: (DIS) VA
GMN	VA	George Mason University: VA
GMNHP	VA	George Mason University: (DIS) VA
GU	VA	Georgetown University: VA
GT	VA	Georgia Tech: VA
GTHP	VA	Georgia Tech: (DIS) VA
GCC	VA	Germanna Community College: VA
GSHP	VA	Great Seal: (DIS) VA
GHIRE	VA	Great Seal For Hire: VA
GHA	VA	Greyhound Adopt: VA
GHHP	VA	Greyhound Adopt: (DIS) VA
HS	VA	Hampden-Sydney College: VA
HU	VA	Hampton University: VA
HOG	VA	Harley Davidson Owners Group: VA
HOGHP	VA	Harley Davidson Owners Group: (DIS) VA
HOGMC	VA	Harley Owners Group Motorcycle: VA
HT	VA	Heritage - State Bird: VA
HC	VA	Hollins University: VA
HMSCH	VA	Home Education: VA
HMSHP	VA	Home Education: (DIS) VA
HORSE	VA	Horse Enthusiasts: VA
HOSHP	VA	Horse Enthusiasts: (DIS) VA
ICI	VA	Internet Capital: VA
ICIHP	VA	Internet Capital: (DIS) VA
JSRCC	VA	J. Sargeant Reynolds Community: VA
JMUA	VA	James Madison Univ. Athletic: VA
JMUS	VA	James Madison University Seal: VA
JY	VA	Jamestown: VA
JYHP	VA	Jamestown: (DIS) VA
JCHS	VA	Jefferson Col of Health Sci: VA
JTCC	VA	John Tyler Community College: VA
KAP	VA	Kappa Alpha Psi: VA
KC	VA	Knights of Columbus: VA
KCHP	VA	Knights of Columbus: (DIS) VA
KWV	VA	Korean War Veteran: VA
KWVHP	VA	Korean War Veteran: (DIS) VA
LWMMC	VA	Law Officers Mem. Motorcycle: VA
LAWM	VA	Law Officers Memorial: VA

PLATE_TYPE_CODE	JURISDICTION_CODE	DESCRIPTION
LAWHP	VA	Law Officers Memorial: (DIS) VA
LVU	VA	Legion of Valor of the USA: VA
LBU	VA	Liberty University: VA
LBUHP	VA	Liberty University: (DIS) VA
LIGHT	VA	Lighthouses (Virginia): VA
LGTHP	VA	Lighthouses (Virginia): (DIS) VA
LV	VA	Lions of Virginia: VA
LVHP	VA	Lions of Virginia: (DIS) VA
LW	VA	Longwood University: VA
LWHP	VA	Longwood University: (DIS) VA
LC	VA	Lynchburg College: VA
LCHP	VA	Lynchburg College: (DIS) VA
MCORP	VA	Marine Corps - Semper Fidelis: VA
MCPHP	VA	Marine Corps - Semper Fidelis: (DIS) VA
ML	VA	Marine Corps League: VA
MLHP	VA	Marine Corps League: (DIS) VA
MR	VA	Marine Corps Reserve: VA
MSU	VA	Marshall University: VA
MB	VA	Mary Baldwin College: VA
MBHP	VA	Mary Baldwin College: (DIS) VA
PHG	VA	Most Worshipful Prince Hall: VA
PHGHP	VA	Most Worshipful Prince Hall: (DIS) VA
MCAV	VA	Motorcycle Antique (blk/wht): VA
LRC	VA	NASA Langley Research Center: VA
LRCHP	VA	NASA Langley Research Center: (DIS) VA
NCSU	VA	NC State University: VA
NBC	VA	Natl College-Business & Tech: VA
NASM	VA	National Air & Space Museum: VA
NASHP	VA	National Air & Space Museum: (DIS) VA
NGRHP	VA	National Guard Retired: (DIS) VA
NRA	VA	National Rifle Association: VA
NRAHP	VA	National Rifle Association: (DIS) VA
NBV	VA	Natural Bridge: VA
NAVAT	VA	Naval Aviator: VA
NR	VA	Naval Reserve: VA
NCHP	VA	Navy Cross Military: VA
SAMPLE	VA	Navy Cross Military: (DIS) VA
NSU	VA	Norfolk State University: VA
NVCC	VA	Northern Virginia Com College: VA
ONAS	VA	Oceana Naval Air Station: VA
ONAHP	VA	Oceana Naval Air Station: (DIS) VA
OHIO	VA	Ohio State University: VA
OHIHP	VA	Ohio State University: (DIS) VA
ODM	VA	Old Dominion University: VA
OPP	VA	Omega Psi Phi Fraternity: VA
ES	VA	Order of The Eastern Star: VA
ESHP	VA	Order of The Eastern Star: (DIS) VA
ODONR	VA	Organ Donor: VA
PRTMC	VA	Parrothead Motorcycle: VA
PRTHD	VA	Parrotheads: VA
PHIRE	VA	Passenger For Hire: VA
PAJT	VA	Passenger Standard Issue (JT): VA
PAJHP	VA	Passenger Standard Issue (JT): (DIS) VA
PHCC	VA	Patrick Henry Com College: VA
PDCCC	VA	Paul D Camp Community College: VA
PHS	VA	Pearl Harbor Survivor: VA

PLATE_TYPE_CODE	JURISDICTION_CODE	DESCRIPTION
PHSHP	VA	Pearl Harbor Survivor: (DIS) VA
PS	VA	Penn State University: VA
PSHP	VA	Penn State University: (DIS) VA
PVCC	VA	Piedmont Virginia Com College: VA
PF	VA	Professional Firefighter-Intl: VA
PH	VA	Purple Heart: VA
PHHP	VA	Purple Heart: (DIS) VA
RU	VA	Radford University: VA
RMCS	VA	Randolph Macon Col - Sch Seal: VA
RMCY	VA	Randolph Macon Col-Yellow Jack: VA
RMWC	VA	Randolph-Macon Womans College: VA
RMWCH	VA	Randolph-Macon Womans College: (DIS) VA
RS	VA	Rescue Squad: VA
RKC	VA	Roanoke College: VA
ROINT	VA	Rotary International: VA
NJ	VA	Rutgers University: VA
SPC	VA	Saint Pauls College: VA
SN	VA	Scenic (Mountain to Seashore): VA
SNAUT	VA	Scenic Autumn: VA
AUTHP	VA	Scenic Autumn: (DIS) VA
SHIRE	VA	Scenic For Hire: VA
SNMC	VA	Scenic Motorcycle: VA
SNPAT	VA	Scenic Patriot: VA
PATHP	VA	Scenic Patriot: (DIS) VA
SNP	VA	Shenandoah National Park Assoc: VA
SNPHP	VA	Shenandoah National Park Assoc: (DIS) VA
SU	VA	Shenandoah University: VA
SHR	VA	Shriner: VA
SHRHP	VA	Shriner: (DIS) VA
SL	VA	Silver Star: VA
SLHP	VA	Silver Star: (DIS) VA
SCV	VA	Sons of Confederate Veterans: VA
SCVHP	VA	Sons of Confederate Veterans: (DIS) VA
SCVMC	VA	Sons of Confederate Vets - MC: VA
FORCE	VA	Special Forces Association: VA
SURF	VA	Surfrider Foundation: VA
SURFH	VA	Surfrider Foundation: (DIS) VA
SBC	VA	Sweet Briar College: VA
TAXI	VA	Taxi (For Hire): VA
TAXPM	VA	Taxi Permanent (For Hire): VA
TEX	VA	Texas A & M University: VA
TCC	VA	Tidewater Community College: VA
TOB	VA	Tobacco Heritage: VA
TOBHP	VA	Tobacco Heritage: (DIS) VA
TWPM	VA	Tow Truck For Hire Permanent: VA
TW	VA	Tow Truck (For Hire): VA
SMTRL	VA	Trailer-Small Permanent: VA
TKH	VA	Truck For Hire: VA
TKHPM	VA	Truck For Hire Permanent: VA
OLDG	VA	U.S. 3rd Infantry Regiment: VA
OLDHP	VA	U.S. 3rd Infantry Regiment: (DIS) VA
UNC	VA	UNC Tar Heels: VA
UNCHP	VA	UNC Tar Heels: (DIS) VA
COLE	VA	USS Cole: VA

PLATE_TYPE_CODE	JURISDICTION_CODE	DESCRIPTION
COLHP	VA	USS Cole: (DIS) VA
WP	VA	United States Military Academy: VA
WPHP	VA	United States Military Academy: (DIS) VA
NA	VA	United States Naval Academy: VA
NAHP	VA	United States Naval Academy: (DIS) VA
UWS	VA	United We Stand: VA
UWSHP	VA	United We Stand: (DIS) VA
UWSMC	VA	United We Stand Motorcycle: VA
UVA	VA	Univ of Virginia - Athletic: VA
UVAHP	VA	Univ of Virginia - Athletic: (DIS) VA
UV	VA	Univ of Virginia - Rotunda: VA
UVHP	VA	Univ of Virginia - Rotunda: (DIS) VA
UF	VA	University of Florida: VA
UMW	VA	University of Mary Washington: VA
UMD	VA	University of Maryland: VA
ND	VA	University of Notre Dame: VA
NDHP	VA	University of Notre Dame: (DIS) VA
URS	VA	University of Richmond - Crest: VA
UR	VA	University of Richmond-Spider: VA
CVC	VA	University of Virginia - Wise: VA
UVC	VA	University of Virginia V-sabre: VA
UVCHP	VA	University of Virginia V-sabre: (DIS) VA
ULATM	VA	Unlocking Autism: VA
VTE	VA	Veteran Armed Forces: VA
VTEHP	VA	Veteran Armed Forces: (DIS) VA
VNV	VA	Vietnam Veteran: VA
VNVHP	VA	Vietnam Veteran: (DIS) VA
VVA	VA	Vietnam Veterans of America: VA
VU	VA	Villanova University: VA
FARM	VA	Virginia Agriculture: VA
VB	VA	Virginia Beach City: VA
VBHP	VA	Virginia Beach City: (DIS) VA
VCUR	VA	Virginia Commonwealth - Ram: VA
RAMHP	VA	Virginia Commonwealth - Ram: (DIS) VA
VCUL	VA	Virginia Commonwealth - Seal: VA
ART	VA	Virginia For The Arts: VA
ARTHP	VA	Virginia For The Arts: (DIS) VA
VHCC	VA	Virginia Highlands Com College: VA
VMI	VA	Virginia Military Insitute: VA
VSC	VA	Virginia Society of CPAs: VA
VSCHP	VA	Virginia Society of CPAs: (DIS) VA
VSU	VA	Virginia State University: VA
GOHOK	VA	Virginia Tech "VT": VA
HOKIE	VA	Virginia Tech - Go Hokies: VA
HOKHP	VA	Virginia Tech - Go Hokies: (DIS) VA
TECH	VA	Virginia Tech - School Seal: VA
VUU	VA	Virginia Union University: VA
VWC	VA	Virginia Wesleyan College: VA
VWCHP	VA	Virginia Wesleyan College: (DIS) VA
WLU	VA	Washington & Lee University: VA
RSKNS	VA	Washington Redskins: VA
RSKHP	VA	Washington Redskins: (DIS) VA
SOW	VA	Wildflower: VA
WLCBA	VA	Wildlife Bass: VA
BAHP	VA	Wildlife Bass: (DIS) VA
WLCBR	VA	Wildlife Bear: VA

PLATE_TYPE_CODE	JURISDICTION_CODE	DESCRIPTION
BRHP	VA	Wildlife Bear: (DIS) VA
WLCBT	VA	Wildlife Brook Trout: VA
BTHP	VA	Wildlife Brook Trout: (DIS) VA
WLCEG	VA	Wildlife Eagle: VA
EGHP	VA	Wildlife Eagle: (DIS) VA
WLCMA	VA	Wildlife Mallard: VA
MAHP	VA	Wildlife Mallard: (DIS) VA
WLCTK	VA	Wildlife Turkey: VA
TKYHP	VA	Wildlife Turkey: (DIS) VA
WLCDE	VA	Wildlife Whitetail Deer: VA
DEHP	VA	Wildlife Whitetail Deer: (DIS) VA
WWII	VA	World War II Veteran: VA
WWVHP	VA	World War II Veteran: (DIS) VA
PAS	VA	Standard Passenger: VA
PASI	VA	Standard Passenger 400 Anniversary: VA

10 Appendix E – Unusual Occurrence (UO) Code

UnusualOccuranceCodeID	UnusualOccuranceCodeDesc
0	No Unusual Occurrence
1	Auth Run Thru
2	Run Thru
3	Under Class
4	Axle Mismatch
5	Verify AVI Tag
6	Invalid AVI Tag
7	Stolen AVI Tag
8	Bad AIV Read
9	Under Payment
10	Operator Init VES
11	Audit VES
12	Over Classification
13	Over Payment
14	Reclassification
15	Reverse Run Thru
16	Backup
17	Lane Update
18	Lane Resync
19	Maint Test
20	Class Mismatch
21	Unpaid Purged VSR no axles no revenue

11 Appendix F – Facility ID and Facility Name

FacilityID	FacilityName	FacilityShortName
1	DULLES GREENWAY	GW
2	DULLES TOLL ROAD	DTR
3	COLEMAN BRIDGE	CB
4	POWHITE PARKWAY	PW
5	RMA	RMA
6	CHESAPEAKE EXPRESSWA`CE
7	POCAHONTAS PARKWAY	POCA
8	CHESAPEAKE BAY BRIDGE`CBBT
9	SOUTH NORFOLK JORDAN I SNJB
10	495 EXPRESS LANES	X495
11	ELIZABETH RIVER CROSSIN ERC

TS-04: APPENDIX B-2

TOLL CORRECTIONS FILE INTERFACE

Toll Corrections File Interface

Virginia Toll Facilities Group – VDOT CSC

Specifications

Version 1.5 – FINAL

October 9, 2012

Revision Status

Date	Version Number	Responsible Party	Comments
5/6/2011	V1.0 - DRAFT	FSTech	Initial Draft
5/19/2011	V1.1 – DRAFT FINAL	FSTech	Add correction reasons the same as IAG; add file delivery timing; add business rules section; add note about posted to IAG queue; allow full transaction modification.
5/27/2011	V1.2 – FINAL	FSTech	Cleaned up XML to match table definitions
5/6/2012	V1.3 – FINAL	FSTech	Added codes for Agency Incentive Corrections to CorrectionReason; Added to Business Rules that Toll Corrections can be made to VTolls; Added VToll Correction File and VToll Correction Reconciliation File
7/6/2012	V1.4 – FINAL	FSTech	Minor Corrections
10/9/2012	V1.5 – FINAL	3M	Corrections for VToll file layout

Table of Contents

List of Tables

1   Introduction

The *Toll Corrections File Interface – VTFG to VDOT CSC - Specifications* document defines the formats for the files that shall be transmitted between the VTFG agencies and the VDOT Customer Service Center (CSC) required to process correction of toll transactions.

1.1   Interface Files

The interface files defined are:

File Name	File Usage
Toll Correction File (see Section 2)	Created by the VTFG agency to inform the CSC of all toll corrections being requested.
Toll Correction Reconciliation File (see Section 3)	Created by the CSC to inform the VTFG agency as to the disposition of toll corrections processed by the CSC as requested by the VTFG agency.
VToll Correction File (see Section 4)	Created by the VTFG agency to inform the CSC of all VToll corrections being requested.
VToll Correction Reconciliation File (see Section 5)	Created by the CSC to inform the VTFG agency as to the disposition of VToll corrections processed by the CSC as requested by the VTFG agency.

1.2   Toll Correction Example

1) A transaction received by the VDOT CSC contains a collected fare of $1.50.

2) The toll facility determines that the toll amount (for whatever the reason) should be $1.00. The toll facility prepares a Toll Correction File (TCF) with the correct fare of $1.00 for the transaction. The original TransSeqID assigned by the VDOT CSC is included for each transaction contained in the Toll Correction File (TCF) prepared by the facility.

3) The Toll Correction File (TCF) is processed and upon finding a match between the TransSeqID in the TCF and the original transaction with the same TransSeqID in the CSC database, the system creates a reversing transaction of +$1.50 (i.e., a $1.50 credit to the account). This is followed by a correcting transaction of -$1.00 (i.e., a $1.00 debit to the account).

4) The original transaction, the reversing transaction, and the correcting transaction are all tracked by the system and logically linked together within the CSC database.

5) A Toll Correction Reconciliation File is produced for all of the corrections processed and returned with a posting status for each correction.

6) The reversing and correcting transactions will also appear on the Disbursement Report for their day of processing.

NOTE: Corrections may be applied to transactions only one time. Any successfully corrected transactions may not be corrected again. If the correction is not successful, the failed correction transaction will be placed in the exception table and appear on the Exception Report as a 'FAILED CORRECTION.'

1.3   VToll Correction Example

1) A VToll by the VDOT CSC contains a collected fare of $1.50.

2) The toll facility determines that the toll amount (for whatever the reason) should be $1.00. The toll facility prepares a VToll Correction File (VTC) with the correct fare of $1.00 for the transaction. The original TransSeqID assigned by the VDOT CSC is included for each transaction contained in the VToll Correction File (VTC) prepared by the facility.

3) The VToll Correction File (VTC) is processed and upon finding a match between the TransSeqID

in the VTC and the original vtoll with the same TransSeqID in the CSC database, the system creates a reversing vtoll of +$1.50 (i.e., a $1.50 credit to the account). This is followed by a correcting vtoll of -$1.00 (i.e., a $1.00 debit to the account).

4) The original vtoll, the reversing vtoll, and the correcting vtoll are all tracked by the system and logically linked together within the CSC database.

5) A VToll Correction Reconciliation File is produced for all of the corrections processed and returned with a posting status for each correction.

6) The reversing and correcting vtolls will also appear on the Disbursement Report for their day of processing.

NOTE: Corrections may be applied to vtolls only one time. Any successfully corrected vtolls may not be corrected again. If the correction is not successful, the failed correction vtoll will be placed in the exception table and appear on the Exception Report as a 'FAILED CORRECTION.'

2 Toll Correction File

2.1 Toll Correction File Content

The following detail fields are included in Toll Correction File:

- The transaction sequence ID for the wrong-fare transaction

- The transaction posting date for the wrong-fare transaction

- The original fare amount for the wrong-fare transaction

- The correct fare amount

2.2 Toll Correction File Naming

The Toll Correction File is named according to the following convention:

TCF[FacilityID]_[FileDateTime].XML
TCF – Is the Toll Correction File
FacilityID – Is the Facility ID
FileDateTime – Is the FileDateTime

Example: For a Toll Correction File created by Agency 002 at 00:43:21 on November 31, 2006, the name of the file would be TCF002_20061131004321.XML.

2.3 Toll Correction File Layout

The Toll Correction File uses XML formatting as defined below.

```
<TollCorrectionFile_1.0>
      <Header>
            <FacilityID></FacilityID>
            <FileID></FileID>
            <FileDateTime></FileDateTime>
            <TransactionCount></TransactionCount>
            <OriginalSum></OriginalSum>
      </Header>
      <DetailData>
            <Transaction>
                  <TransSeqID></TransSeqID>
                  <TransPostingDate></TransPostingDate>
                  <OriginalTollAmount> </OriginalTollAmount>
```

```
                    <CorrectionReason></CorrectionReason>
                    <TransactionType></TransactionType>
                    <ExitDateTime></ExitDateTime>
                    <ExitPlazaID></ExitPlazaID>
                    <ExitLaneID></ExitLaneID>
                    <ExitLaneSeqNo></ExitLaneSeqNo>
                    <EntryDateTime></EntryDateTime>
                    <EntryPlazaID></EntryPlazaID>
                    <EntryLaneID></EntryLaneID>
                    <EntryLaneSeqNo></EntryLaneSeqNo>
                    <PricingDateTime></PricingDateTime>
                    <PreClassForward></PreClassForward>
                    <PreClassReverse></PreClassReverse>
                    <ForwardAxles></ForwardAxles>
                    <ReverseAxles></ReverseAxles>
                    <TollAmount></TollAmount>
                    <VehicleClass></VehicleClass>
                    <NominationMethod></NominationMethod>
                    <TagID></TagID>
                    <TagRegion></TagRegion>
                    <TagAuthority></TagAuthority>
                    <TagStatus></TagStatus>
                    <TagFileAgency></TagFileAgency>
                    <TagFileDateTime></TagFileDateTime>
                    <Switchable></Switchable>
                </Transaction>
…
        </DetailData>
        <Footer></Footer>
</TollCorrectionFile_1.0>
```

2.4   Toll Correction File Data Elements

2.4.1   Top Level (Root) Tag

The file description used in the top-level xml tag will be <TollCorrectionFile_1.0>.

2.4.2   Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed in Table 2-1 are the data elements for the <Header> record in a Toll Correction File.

Table 2-1 Data Elements for the <Header> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
FacilityID	Yes	UnsignedShort	Facility ID providing this data file. . Match to the number used by the VDOT CSC.
FileID	Yes	unsignedLong	Unique Identifier for this file. To help with tracking the files and associating them with sets of corrections. Ideally, an ascending sequence starting with 1, unique within the facility. Not necessarily contiguous (to allow for files that are generated but

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			not submitted)
FileDateTime	Yes	dateTime	Date/Time this file was created. Formatted as YYYY-MM-DD HH:MM:SS
TransactionCount	Yes	unsignedLong	Number of Transaction records in the file.
OriginalSum	Yes	decimal	Total summation of the OriginalTollAmount field in all Transaction records in this file.

2.4.3   Detail Data

Each transaction record will be contained within a <Transaction> record. Listed in Table 2-2 are the data elements for the <Transaction> record.

Table 2-2 Data Elements for the <Transaction> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
TransSeqID	Yes	unsignedLong	Transaction Sequence Number for the transaction to be adjusted
TransPostingDate	Yes	string	Transaction Posting Date of the transaction that is to be adjusted. Formatted as YYYY-MM-DD

If this value exist, then TransSeqID is mandatory. |
| **OriginalTollAmount** | Yes | decimal | Original Transaction Amount to be corrected |
| **CorrectionReason** | Yes | Unsigned short | A code denoting the reason for the correction. Values: 01 – Resolved mismatch: class/toll corrected 02 – Ignore license plate transaction 03 – Ignore tagged transaction 04 – Corrected plaza/lane information 05 – Corrected toll 06 – 09 – RESERVED FOR FUTURE USE 10 – 495 Express Lanes Incentive 11 – Elizabeth River Incentive |

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
TransactionType	Yes	Char(1)	Type of Transaction – per Black Box Specs
ExitDateTime	Yes	Date	Date/Time of the Exit event – per Black Box specs
ExitPlazaID	Yes	Unsigned short	Plaza ID of the Exit event – per Black Box specs
ExitLaneID	Yes	Unsigned short	Lane ID of the Exit event – per Black Box specs
ExitLaneSeqNo	Yes	Unsigned long	Lane Sequence Number of the transaction for the Exit event – per Black Box specs
EntryDateTime	Yes	Date	Date/Time of the Entry event – per Black Box specs
EntryPlazaID	Yes	Unsigned short	Plaza ID of the Entry event – per Black Box specs
EntryLaneID	Yes	Unsigned short	Lane ID of the Entry event – per Black Box specs
EntryLaneSeqNo	Yes	Unsigned long	Lane Sequence Number of the transaction for the Entry event – per Black Box specs
PricingDateTime	No	date	Date/Time used to price this transaction – per Black Box specs
PreClassForward	Yes	Integer	Preclass forward axle count – per Black Box specs
PreClassReverse	Yes	Integer	Preclass reverse axle count – per Black Box specs
ForwardAxles	Yes	Integer	Forward axle count – per Black Box specs
ReverseAxles	Yes	Integer	Reverse axle count – per Black Box specs
TollAmount	Yes	Decimal	Toll amount in cents
VehicleClass	Yes	Integer	Vehicle classification resulting from lane/plaza processing. Based on lane sensors, tag class, collector input, etc. according to business rules specific to the facility – per Black Box Specs
NominationMethod	Yes	Unsigned short	Nomination method code for AVI – Per Black Box Specs
TagID	Yes	Unsigned long	Tag id – supplied by lane, as read by the tag reader. Tag number should be one of those present in the tag status file provided by the CSC.

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
TagRegion	Yes	Integer	Tag region – supplied by lane, as read by tag reader – Per Black Box Specs
TagAuthority	Yes	Integer	Issuing authority – supplied by lane, as read by tag reader (typically IAG Agency Code) – Per IAG Specs
TagStatus	Yes	Unsigned short	Tag status, as known by lane/plaza system at time of transaction (see section 4 of the Black Box Interface specifications for the tag status format). The tag status information from the tag status file in use. For example: A tag that is low balance (001), revenue (0), discount bit not set (0), IAG bit not set (0), an internal tag (0), and an HOV tag (1) would be show in binary as follows: 0000000010000001 would be shown in the XML string in hex as: 0x0081
TagFileAgency	Yes	Unsigned Short	Facility ID from the Tag file containing this Tag Status.
TagFileDateTime	Yes	Date	Date/Time of the Tag file containing this Tag Status. Formatted as YYYY-MM-DD HH:MM:SS
Switchable	Yes	Unsigned short	HOV Status of Tag – Per Black Box Specs

2.4.4   Footer
Each file will contain a footer record with no required data elements.

3 Toll Correction Reconciliation File

3.1 Toll Correction Reconciliation File Content

The following detail fields are included in Toll Correction Reconciliation File:

- OriginalTransSeqID
- OriginalTransPostingDate
- The posting status

3.2 Toll Correction Reconciliation File Naming

The Toll Correction Reconciliation File is named according to the following convention:.

TCR[FacilityID]_[FileDateTime].XML
TCR – Is the Toll Correction Reconciliation File
FacilityID – Is the Facility ID of the original transaction file
FileDateTime – Is the FileDateTime of the original transaction file

Example: For a Toll Correction Reconciliation File created to respond to a Toll Correction File created by Facility 002 at 00:43:21 on November 31, 2006, the name of the file would be TCR002_20061131004321.XML.

3.3 Toll Correction Reconciliation File Layout

The Toll Correction Reconciliation File uses XML formatting as defined below.

```
<TollCorrectionReconciliationFile_1.0>
      <Header>
            <FacilityID></FacilityID>
            <FileID></FileID>
            <FileDateTime></FileDateTime>
            <TransactionCount></TransactionCount>
      </Header>
      <DetailData>
            <TollCorrectionReconciliation>
                  <OriginalTransSeqID></OriginalTransSeqID>
                  <OriginalTransPostingDate></OriginalTransPostingDate>
                  <PostingStatus></PostingStatus>
            </TollCorrectionReconciliation>
…
      </DetailData>
      <Footer></Footer>
</TollCorrectionReconciliationFile_1.0>
```

3.4 Toll Correction Reconciliation File Data Elements

3.4.1 Top Level (Root) Tag

The file description used in the top-level xml tag will be <TollCorrectionReconciliationFile_1.0> .

3.4.2 Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed in Table 3-1 are the data elements for the <Header> record in a Toll Correction Reconciliation File.

Table 3-1 Data Elements for the <Header> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
FacilityID	Yes	UnsignedShort	Facility ID from the original Toll Correction File.
FileID	Yes	unsignedLong	Unique Identifier for this file from the original Toll Correction File.
FileDateTime	Yes	dateTime	Date/Time from the original Toll Correction File. Formatted as YYYY-MM-DD HH:MM:SS
TransactionCount	Yes	unsignedLong	Number of Transaction records in this file.

3.4.3   Detail Data

Each transaction record will be contained within a <TollCorrectionReconciliation> record. Listed in Table 3-2 are the data elements for the <TollCorrectionReconciliation> record.

Table 3-2 Data Elements for the <TollCorrectionReconciliation> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
TransSeqID	Yes	unsignedLong	TransactionSeqID of the original transaction
TransPostingDate	Yes	int	TransPostingDate of the original transaction Formatted as YYYYMMDD
PostingStatus	Yes	String	POST – Toll correction posted successfully. FAILED – Toll correction failed to post.

3.4.4   Footer
Each file will contain a footer record with no required data elements.

4   VToll Correction File

4.1   VToll Correction File Content

The following detail fields are included in VToll Correction File:

- The transaction sequence ID for the original transaction

- The transaction posting date for the original transaction

- The original fare amount for the original transaction

- The correct fare amount

4.2   VToll Correction File Naming

The VToll Correction File is named according to the following convention:

VTC[FacilityID]_[FileDateTime].XML
VTC – Is the VToll Correction File
FacilityID – Is the Facility ID
FileDateTime – Is the FileDateTime

Example: For a VToll Correction File created by Agency 002 at 00:43:21 on November 31, 2006, the name of the file would be VTC002_20061131004321.XML.

4.3   VToll Correction File Layout

The VToll Correction File uses XML formatting as defined below.

```
<VTollCorrectionFile_1.0>
      <Header>
              <FacilityID></FacilityID>
              <FileID></FileID>
              <FileDateTime></FileDateTime>
              <TransactionCount></TransactionCount>
              <OriginalSum></OriginalSum>
      </Header>
      <DetailData>
            <Transaction>
                    <TransSeqID></TransSeqID>
                    <TransPostingDate></TransPostingDate>
                    <OriginalTollAmount> </OriginalTollAmount>
                    <CorrectionReason></CorrectionReason>
                    <TransactionType></TransactionType>
                    <ExitDateTime></ExitDateTime>
                    <ExitPlazaID></ExitPlazaID>
                    <ExitLaneID></ExitLaneID>
                    <ExitLaneSeqNo></ExitLaneSeqNo>
                    <EntryDateTime></EntryDateTime>
                    <EntryPlazaID></EntryPlazaID>
                    <EntryLaneID></EntryLaneID>
                    <EntryLaneSeqNo></EntryLaneSeqNo>
                    <PricingDateTime></PricingDateTime>
                    <PreClassForward></PreClassForward>
```

```
                    <PreClassReverse></PreClassReverse>
                    <ForwardAxles></ForwardAxles>
                    <ReverseAxles></ReverseAxles>
                    <TollAmount></TollAmount>
                    <VehicleClass></VehicleClass>
                    <NominationMethod></NominationMethod>
                    <TagID></TagID>
                    <TagRegion></TagRegion>
                    <TagAuthority></TagAuthority>
                    <TagStatus></TagStatus>
                    <TagFileAgency></TagFileAgency>
                    <TagFileDateTime></TagFileDateTime>
                    <LicenseNumber></LicenseNumber>
                    <LicenseState></LicenseState>
                    <PlateFileAgency></PlateFileAgency>
                    <PlateFileDateTime></PlateFileDateTime>
                    <Switchable></Switchable>
            </Transaction>
…
        </DetailData>
        <Footer></Footer>
</VTollCorrectionFile_1.0>
```

4.4   VToll Correction File Data Elements

4.4.1   Top Level (Root) Tag

The file description used in the top-level xml tag will be <VTollCorrectionFile_1.0>.

4.4.2   Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed in Table 2-1 are the data elements for the <Header> record in a VToll Correction File.

Table 4-1 Data Elements for the <Header> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
FacilityID	Yes	UnsignedShort	Facility ID providing this data file. . Match to the number used by the VDOT CSC.
FileID	Yes	unsignedLong	Unique Identifier for this file. To help with tracking the files and associating them with sets of corrections. Ideally, an ascending sequence starting with 1, unique within the facility. Not necessarily contiguous (to allow for files that are generated but not submitted)
FileDateTime	Yes	dateTime	Date/Time this file was created. Formatted as YYYY-MM-DD HH:MM:SS

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
TransactionCount	Yes	unsignedLong	Number of Transaction records in the file.
OriginalSum	Yes	decimal	Total summation of the OriginalTollAmount field in all Transaction records in this file.

4.4.3 Detail Data

Each transaction record will be contained within a <Transaction> record. Listed in Table 2-2 are the data elements for the <Transaction> record.

Table 4-2 Data Elements for the <Transaction> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
TransSeqID	Yes	unsignedLong	Transaction Sequence Number for the transaction to be adjusted
TransPostingDate	Yes	string	Transaction Posting Date of the transaction that is to be adjusted. Formatted as YYYY-MM-DD If this value exist, then TransSeqID is mandatory.
OriginalTollAmount	Yes	decimal	Original Transaction Amount to be corrected
CorrectionReason	Yes	Unsigned short	A code denoting the reason for the correction. Values: 01 – Resolved mismatch: class/toll corrected 02 – Ignore license plate transaction 03 – Ignore tagged transaction 04 – Corrected plaza/lane information 05 – Corrected toll 06 – 09 – RESERVED FOR FUTURE USE 10 – 495 Express Lanes Incentive 11 – Elizabeth River Incentive
TransactionType	Yes	Char(1)	Type of Transaction – per Black Box Specs
ExitDateTime	Yes	Date	Date/Time of the Exit event – per Black Box specs
ExitPlazaID	Yes	Unsigned short	Plaza ID of the Exit event –

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			per Black Box specs
ExitLaneID	Yes	Unsigned short	Lane ID of the Exit event – per Black Box specs
ExitLaneSeqNo	Yes	Unsigned long	Lane Sequence Number of the transaction for the Exit event – per Black Box specs
EntryDateTime	Yes	Date	Date/Time of the Entry event – per Black Box specs
EntryPlazaID	Yes	Unsigned short	Plaza ID of the Entry event – per Black Box specs
EntryLaneID	Yes	Unsigned short	Lane ID of the Entry event – per Black Box specs
EntryLaneSeqNo	Yes	Unsigned long	Lane Sequence Number of the transaction for the Entry event – per Black Box specs
PricingDateTime	No	date	Date/Time used to price this transaction – per Black Box specs
PreClassForward	Yes	Integer	Preclass forward axle count – per Black Box specs
PreClassReverse	Yes	Integer	Preclass reverse axle count – per Black Box specs
ForwardAxles	Yes	Integer	Forward axle count – per Black Box specs
ReverseAxles	Yes	Integer	Reverse axle count – per Black Box specs
TollAmount	Yes	Decimal	Toll amount in cents
VehicleClass	Yes	Integer	Vehicle classification resulting from lane/plaza processing. Based on lane sensors, tag class, collector input, etc. according to business rules specific to the facility – per Black Box Specs
NominationMethod	Yes	Unsigned short	Nomination method code for AVI – Per Black Box Specs
TagID	Yes(if no plate info)	Unsigned long	Tag id – supplied by lane, as read by the tag reader. Tag number should be one of those present in the tag status file provided by the CSC.
TagRegion	Yes(if no plate info)	Integer	Tag region – supplied by lane, as read by tag reader – Per Black Box Specs
TagAuthority	Yes(if no plate info)	Integer	Issuing authority – supplied by lane, as read by tag reader (typically IAG Agency Code)

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			– Per IAG Specs
TagStatus	Yes(if no plate info)	Unsigned short	Tag status, as known by lane/plaza system at time of transaction (see section 4 of the Black Box Interface specifications for the tag status format). The tag status information from the tag status file in use. For example: A tag that is low balance (001), revenue (0), discount bit not set (0), IAG bit not set (0), an internal tag (0), and an HOV tag (1) would be show in binary as follows: 0000000010000001 would be shown in the XML string in hex as: 0x0081
TagFileAgency	Yes(if no plate info)	Unsigned Short	Facility ID from the Tag file containing this Tag Status.
TagFileDateTime	Yes (if no plate info)	Date	Date/Time of the Tag file containing this Tag Status. Formatted as YYYY-MM-DD HH:MM:SS
LicenseNumber	Yes (if no tag info)		
LicenseState	Yes (if no tag info)		
PlateFileAgency	Yes (if no tag info)	Unsigned Short	Facility ID from the Plate file containing this License Plate
PlateFileDateTime	Yes (if no tag info)	Date	Date/Time of the Plate file containing this License Plate. Formatted as YYYY-MM-DD HH:MM:SS
Switchable	Yes	Unsigned short	HOV Status of Tag – Per Black Box Specs

4.4.4   Footer
Each file will contain a footer record with no required data elements.

5   VToll Correction Reconciliation File

5.1   VToll Correction Reconciliation File Content

The following detail fields are included in VToll Correction Reconciliation File:

- OriginalTransSeqID
- OriginalTransPostingDate
- The posting status

5.2   VToll Correction Reconciliation File Naming

The VToll Correction Reconciliation File is named according to the following convention:.

VCR[FacilityID]_[FileDateTime].XML
VCR – Is the VToll Correction Reconciliation File
FacilityID – Is the Facility ID of the original transaction file
FileDateTime – Is the FileDateTime of the original transaction file

Example: For a VToll Correction Reconciliation File created to respond to a VToll Correction File created by Facility 002 at 00:43:21 on November 31, 2006, the name of the file would be VCR002_20061131004321.XML.

5.3   VToll Correction Reconciliation File Layout

The VToll Correction Reconciliation File uses XML formatting as defined below.

```
<VTollCorrectionReconciliationFile_1.0>
        <Header>
                <FacilityID></FacilityID>
                <FileID></FileID>
                <FileDateTime></FileDateTime>
                <TransactionCount></TransactionCount>
        </Header>
        <DetailData>
                <VTollCorrectionReconciliation>
                        <OriginalTransSeqID></OriginalTransSeqID>
                        <OriginalTransPostingDate></OriginalTransPostingDate>
                        <PostingStatus></PostingStatus>
                </VTollCorrectionReconciliation>
…
        </DetailData>
        <Footer></Footer>
</VTollCorrectionReconciliationFile_1.0>
```

5.4   VToll Correction Reconciliation File Data Elements

5.4.1   Top Level (Root) Tag

The file description used in the top-level xml tag will be <VTollCorrectionReconciliationFile_1.0> .

5.4.2   Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed in Table 5-1 are the data elements for the <Header> record in a VToll Correction Reconciliation File.

Table 5-1 Data Elements for the \<Header\> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
FacilityID	Yes	UnsignedShort	Facility ID from the original Toll Correction File.
FileID	Yes	unsignedLong	Unique Identifier for this file from the original Toll Correction File.
FileDateTime	Yes	dateTime	Date/Time from the original Toll Correction File. Formatted as YYYY-MM-DD HH:MM:SS
TransactionCount	Yes	unsignedLong	Number of Transaction records in this file.

5.4.3 Detail Data

Each transaction record will be contained within a \<VTollCorrectionReconciliation\> record. Listed in Table 5-2 are the data elements for the \<VTollCorrectionReconciliation\> record.

Table 5-2 Data Elements for the \<TollCorrectionReconciliation\> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
TransSeqID	Yes	unsignedLong	TransactionSeqID of the original transaction
TransPostingDate	Yes	int	TransPostingDate of the original transaction Formatted as YYYYMMDD
PostingStatus	Yes	String	POST – Toll correction posted successfully. FAILED – Toll correction failed to post.

5.4.4 Footer
Each file will contain a footer record with no required data elements.

6   General File Requirements

1) All files shall be compressed (ZIPped) using a standard Lempel-Zif compression algorithm which should yield a compression rate of at least 75% (meaning a file will be reduced so that it is only 25% of its original size).
2) When compressed, file names shall be converted from {FILE_NAME}.{FILE_TYPE} to {FILE_NAME}_{FILE_TYPE}.ZIP and all files names shall be created using uppercase characters only. Therefore, when file "TCF002_20061131004321.XML" is compressed, the compressed file shall be named "TCF002_20061131004321_XML.ZIP".
3) Files will be fully created, and zipped before being made available on an FTP server.
4) The FTP account space for each agency using this service is divided into 'IN' and 'OUT' subdirectories.
5) All files being delivered by the using Agency will be dropped off into the 'IN' subdirectory.
6) When transferring the .ZIP files to the FTP server, rename the extension from .ZIP to .ZAP before transferring the file. Then transfer the file to the FTP site. The .ZAP extension tells the receiving code that a file transfer is in progress and do not process this file.
7) When the file transfer has been completed, change the file extension back to .ZIP for the file just delivered to the FTP server. This lets the receiving code know that the file can now be processed.
8) The process described in 6) and 7) are also used by the CSC when delivering response files to the 'OUT' subdirectory. Never pick up a file with the .ZAP extension.
9) If a file has been delivered to the 'IN' subdirectory, and the receiving code determines that there is a problem between the header data and the contents of the file, the original file will have a .bad extension added to it, and will then be placed in the 'OUT' subdirectory.
10) The CSC receiving code will be responsible for keeping the 'IN' subdirectory cleaned out of all processed files.
11) The using Agency is responsible for cleaning out the 'OUT' subdirectory after receiving the response and .bad files.

7   Business Rules

1) The toll corrections apply to all VDOT and IAG accounts.
2) Toll corrections can be made to tolls and VTolls
3) Toll corrections to normal transactions (tolls) are applied through the use of the Toll Correction File and the Toll Correction Reconciliation File.
4) Toll corrections to VTolls are applied through the use of the VToll Correction File and VToll Correction Reconciliation File.
5) A response to a toll correction posted to an IAG account will ONLY indicate that the correction has been posted to the Outgoing IAG queue.
6) A toll correction file can be submitted once a day for processing, with a response file returned upon completion of the processing. Timing will be determined for each agency using this specification.

TS-04: APPENDIX B-3

TOLL RECONCILIATION RESPONSE FILE INTERFACE

Toll Reconciliation Response File Interface

Virginia Toll Facilities Group – VDOT CSC

Specifications

Version 1.3 – DRAFT

September 29, 2016

Revision Status

Date	Version Number	Responsible Party	Comments
5/6/2011	V1.0 - DRAFT	FSTech	Initial Draft
5/19/2011	V1.1 – DRAFT FINAL	FSTech	Add notes about delivery, coverage; removed all transactions fields except SourceSeqID plus new 4 response fields; fixed section 2.1
5/27/2011	V1.2 - FINAL	FSTech	Final – Cleaned up posting status definitions
9/29/2016	V1.3 – DRAFT	Faneuil	Updated duplicate posting time frame for RJPD transactions

Table of Contents

List of Tables

1   Introduction

The *Toll Reconciliation Response File Interface – VTFG - VDOT CSC - Specifications* document defines the format for the file that will be transmitted from the VDOT Customer Service Center (CSC) to the VTFG Agencies.

2   Toll Reconciliation Response File

2.1   Toll Reconciliation Response File Content

The following detail fields are included in Toll Reconciliation Response File:

- Source Sequence Number
- Original Toll Amount
- CSC Transaction Sequence ID
- Transaction Posting Date
- Collected Revenue
- Posting Status

2.2   Toll Reconciliation Response File Naming

The Toll Reconciliation Response File is named according to the following convention:

TRECON[AgencyID]_[FileDateTime].XML
TRECON – Is the Toll Reconciliation Response File
AgencyID – Identification of the Agency receiving this reconciliation file
FileDateTime – Is the FileDateTime

Example: For a Toll Reconciliation Response File created at 00:43:21 on November 31, 2006 for agency 002, the name of the file would be TRECON002_20061131004321.XML.

2.3   Toll Reconciliation Response File Layout

The Toll Reconciliation Response File uses XML formatting as defined below.

```
<TRECONFile_1.0>
     <HEADER>
          <RevenueDate></RevenueDate>
          <TransactionCount></TransactionCount>
          <ExpectedSum></ExpectedSum>
          <CollectedSum></CollectedSum>
     </HEADER>
     <TRECON>
          <SourceSeqNo></SourceSeqNo>
          <TollAmount></TollAmount>
          <TransSeqID></TransSeqID>
          <TransPostingDate></TransPostingDate>
          <CollectedRevenue></CollectedRevenue>
          <PostingStatus></PostingStatus>
     </TRECON>
     …
     <FOOTER></FOOTER>
</TRECONFile_1.0>
```

2.4   Toll Reconciliation Response File Data Elements

2.4.1   Top Level (Root) Tag

The file description used in the top-level xml tag will be <TRECONFile_1.0>.

2.4.2   Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed in Table 2-1 are the data elements for the <Header> record in a Toll Reconciliation Response File.

Table 2-1 Data Elements for the <HEADER> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
RevenueDate	Yes	date	Revenue Date for the transactions contained in this File. Formatted as YYYY-MM-DD
TransactionCount	Yes	unsignedLong	Number of Transaction records in the file.
ExpectedSum	Yes	decimal	Total summation of the Toll Amount field for all Transaction records in this file.
CollectedSum	Yes	decimal	Total summation of the Revenue Collected field for all Transaction records in this file.

2.4.3   Toll Reconciliation Response Data

Each transaction record will be contained within a <TRECON> record. Listed in Table 2-2 are the data elements for the <TRECON> record.

Table 2-2 Data Elements for the <TRECON> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
SourceSeqNo	Yes	unsignedLong	Original Sequence Number of the transaction provided by the roadway toll system.
TollAmount	Yes	decimal	Expected Transaction Amount.
TransSeqID	Yes	unsignedLong	The Transaction Sequence ID assigned by the CSC.
TransPostingDate	Yes	int	Transaction Posting Date assigned by the CSC. Formatted as YYYYMMDD
CollectedRevenue	Yes	decimal	Amount of the revenue collected, if the transaction has a POST, PPST, or NPST status. Any other posting status will have Collected Revenue of 0.
PostingStatus	Yes	String	POST – Toll transaction posted successfully via tag. INSU – Rejected, account has insufficient funds where transaction date/time (ETC_EXIT_DATE/ ETC_EXIT_TIME) is greater than date/time of Tag Status File that

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			indicated that the tag was in Negative Balance status.
			OLD1 - Rejected, old transaction – account closed. The difference between the date of the transaction and the date the transaction was received by the CSC exceeded that specified in the Black Box Interface Specification or the IAG Reciprocity Agreement under Account Settlement Process for Valid Tag Transactions when accounts are closed.
			OLD2 - Rejected, old transaction – other. The difference between the date of the transaction and the date the transaction was received by the CSC exceeded that specified in the Black Box Interface Specification or the IAG Reciprocity Agreement under Account Settlement Process for Valid Tag Transactions when accounts are not closed.
			ACCB – Rejected, account in bad status (revoked, closed, etc.) where transaction date/time (ETC_EXIT_DATE/ ETC_EXIT_TIME) is greater than date/time of Tag Status File that indicated that the tag was in an Invalid status.
			RINV - Rejected, the transaction contains invalid data.
			TAGB – Rejected, tag in bad status (e.g., lost, stolen, etc.) where transaction date/time (ETC_EXIT_DATE/ ETC_EXIT_TIME) is greater than date/time of Tag Status File that indicated that the tag was in a Lost/Stolen status.
			RJDP - Rejected, duplicate transaction. Usually associated with a skip read or cross lane read where a tagged transaction and license plate transaction exist for the same customer

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			at the same plaza within forty-five (45) seconds.

2.4.4   Footer

Each file will contain a footer record with no required data elements.

3   General File Requirements

1) All files shall be compressed (ZIPped) using a standard Lempel-Zif compression algorithm which should yield a compression rate of at least 75% (meaning a file will be reduced so that it is only 25% of its original size).
2) When compressed, file names shall be converted from {FILE_NAME}.{FILE_TYPE} to {FILE_NAME}_{FILE_TYPE}.ZIP and all files names shall be created using uppercase characters only. Therefore, when file "TRECON20061131004321.XML" is compressed, the compressed file shall be named "TRECON20061131004321_XML.ZIP".
3) Files will be fully created, and zipped before being made available on an FTP server.
4) The FTP account space for each agency using this service is divided into 'IN' and 'OUT' subdirectories.
5) All files being delivered by the CSC will be dropped off into the 'OUT' subdirectory.
6) When transferring the .ZIP files to the FTP server, rename the extension from .ZIP to .ZAP before transferring the file. Then transfer the file to the FTP site. The .ZAP extension tells the receiving code that a file transfer is in progress and do not process this file.
7) When the file transfer has been completed, change the file extension back to .ZIP for the file just delivered to the FTP server. This lets the receiving code know that the file can now be processed.
8) The using Agency is responsible for cleaning out the 'OUT' subdirectory after receiving the response and .bad files.

4   Business Rules

1) A reconciliation file will be sent every day, seven days a week.
2) The period cover by the reconciliation file will be for the revenue day (all transactions posted from midnight to midnight).
3) The reconciliation file will contain all transactions processed through the Black Box Interface, including exceptions.
4) The status for IAG transactions will reflect posting to the Outgoing IAG transaction queue.
5) The file will be delivered after 2AM (Eastern Time).

TS-04: APPENDIX C

TOLL RATE SCHEDULE

TOLL RATE SCHEDULE

Facility	E-ZPass Toll Rate	Cash Toll Rate
Powhite Parkway		
- 2 Axle Vehicle	$0.70	$0.70
- 3 Axle Vehicle	$0.80	$0.80
- 4 Axle Vehicle	$0.90	$0.90
- 5 (or more) Axle Vehicle	$1.00	$1.00
Downtown Expressway		
- 2 Axle Vehicle	$0.70	$0.70
- 3 Axle Vehicle	$0.80	$0.80
- 4 Axle Vehicle	$0.90	$0.90
- 5 (or more) Axle Vehicle	$1.00	$1.00
Forest Hill		
- 2 Axle Vehicle	$0.70	$0.70
- 3 Axle Vehicle	$0.80	$0.80
- 4 Axle Vehicle	$0.90	$0.90
- 5 (or more) Axle Vehicle	$1.00	$1.00
Boulevard Bridge		
- 2 Axle Vehicle	$0.35	$0.35
- 3 Axle Vehicle	$0.70	$0.70
- 4 (or more) Axle Vehicle	Not allowed	Not allowed
Douglasdale		
- 2 Axle Vehicle	$0.20	$0.20
- 3 Axle Vehicle	$0.40	$0.40
- 4 Axle Vehicle	$0.40	$0.40
- 5 (or more) Axle Vehicle	$0.40	$0.40
2nd Street		
- 2 Axle Vehicle	$0.35	$0.35
- 3 Axle Vehicle	$0.70	$0.70
- 4 Axle Vehicle	$0.70	$0.70
- 5 (or more) Axle Vehicle	$0.70	$0.70
11th Street		
- 2 Axle Vehicle	$0.30	$0.30
- 3 Axle Vehicle	$0.60	$0.60
- 4 Axle Vehicle	$0.60	$0.60
- 5 (or more) Axle Vehicle	$0.60	$0.60

TS-04: APPENDIX D

PROJECTED TRAFFIC VOLUMES

ESTIMATED FUTURE MONTHLY VOLUMES

Future Year =	2027
Assumed Growth Rate =	1.50%

Eastbound DTE lanes	1,176,509
Westbound DTE lanes	1,199,326
11th Street off ramps	128,797
11th Street on ramps	138,598
2nd Street off ramp	68,911
2nd Street on ramp	63,764
Douglasdale off ramp	30,278
Douglasdale on ramp	61,328
Boulevard lanes	577,347
PW ORT Northbound	1,293,421
PW ORT Southbound	1,177,166
Powhite gated lanes northbound	685,578
Powhite gated lanes southbound	728,629
Forest Hill On Ramps	335,955
Forest Hill Off Ramp	386,438

TS-05

Tolling Specification #05: ORT Zone Subsystem

TOLLING SPECIFICATION #05: ORT ZONE SUBSYSTEM

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Wide area network demarcation points are provided as Appendix A of the TS-03 document and reference drawings for the plaza and ramp locations are provided as Appendix B there. The toll rate schedule is provided as Appendix C of the TS-04 document and traffic projections are provided as Appendix D there.

1. ACRONYMS & KEY TERMS

Acronyms and key terms are defined in the TS-01 document.

2. LOCATIONS

Contract Criteria	

TS-05 Requirement #2-1	The Contractor shall integrate, furnish and install a complete ORT Zone Subsystem providing all functions described in section 3 below at each of the following locations:
	  a) Powhite Parkway Northbound
	  b) Powhite Parkway Southbound
	  c) Downtown Expressway Westbound

TS-05 Requirement #2-2	The ORT Zone Subsystem elements at each such location shall be implemented on separate hardware from, and operate fully independent of, Toll System elements at any other location.
TS-05 Requirement #2-3	The ORT Zone Subsystem elements at each such location shall provide all of the functions described in section 3 below (and its subsections) at the specified performance levels.

The ORT zone roadway; gantries; pavement and other items provided by the Authority at these locations are detailed in the reference drawings provided in Appendix B of the TS-03 document.

3. SUBSYSTEM FUNCTION & PERFORMANCE

Proposal Criteria
The Offeror shall include in their proposal a summary, of no more than one (1) page-side, listing all their previous open road tolling zone installation, (major and minor) upgrade and replacement work within the last five years.

Contract Criteria	
TS-05 Requirement #3-1	The ORT Zone Subsystem shall be integrated with the Host Subsystem (described in the TS-03 document).
TS-05 Requirement #3-2	The ORT Zone Subsystem shall be integrated with a primary and secondary network time protocol (NTP) server and these shall be the same as for all other Toll System elements.
TS-05 Requirement #3-3	The ORT Zone Subsystem shall immediately recover from all instances of vehicles backing up through the zone and this activity shall not impact the detection and recording of other vehicles travelling in the zone.

Contract Criteria	
TS-05 Requirement #3-4	All communications between all ORT Zone Subsystem elements shall use guaranteed transmission protocols.
TS-05 Requirement #3-5	All such communications shall be stored in a manner that makes it easy for an Authority user(s) to search for a data communication or period of communications, locate the communication(s) in the log, display that part of the log, make a copy of that part of the log in .pdf file format and email it as a .pdf file.

3.1. Operating Modes

Contract Criteria	
TS-05 Requirement #3.1-1	The ORT Zone Subsystem shall provide an "open mode" of operation and a "maintenance mode" of operation.
TS-05 Requirement #3.1-2	The ORT Zone Subsystem shall provide for the mode of operation to be selectable individually for each of the three (3) ORT zone locations described in section 2 above.
TS-05 Requirement #3.1-3	The ORT Zone Subsystem shall provide for an Authority user(s) to make such selections from any workstation connected to the Authority's wide area network without special software or hardware.
TS-05 Requirement #3.1-4	When a location is operating in "open mode", the ORT Zone Subsystem shall send all electronic records (see section 3.2 below) from that location to the Host Subsystem and indicate that they were sent while the location was in open mode.
TS-05 Requirement #3.1-5	When a location is operating in "open mode", the ORT Zone Subsystem shall send all violation images as described in section 3.3.3 below.
TS-05 Requirement #3.1-6	When a location is operating in "maintenance mode", the ORT Zone Subsystem shall send all electronic records from that location to the Host Subsystem and indicate that they were sent while the location was in maintenance mode.
TS-05 Requirement #3.1-7	When a location is operating in "maintenance mode", the ORT Zone Subsystem shall not transmit violation images and shall instead store them locally for thirty (30) days.
TS-05 Requirement #3.1-8	When a location is operating in "maintenance mode", the ORT Zone Subsystem shall cause the Host Subsystem's MOMS function to log, store and send an alert at given intervals stating that this location is in maintenance mode, where the given interval shall be configurable by an Authority user(s).

3.2. Transaction Processing

Contract Criteria	
TS-05 Requirement #3.2-1	The ORT Zone Subsystem shall create one and only one electronic record for each vehicle that passes through an ORT zone anywhere on the travel lanes or shoulders.
TS-05 Requirement #3.2-2	Each such electronic record shall contain the following: a) ORT zone identifier b) A field indicating whether such zone was operating in open mode or maintenance mode c) Time and date of passage d) Areas of the ORT zone that the vehicle travelled through including but not limited to the lane number(s), straddling and shoulder involvement e) The axle count and corresponding Authority vehicle class as determined by the Toll System (described in section 3.4 below)
TS-05 Requirement #3.2-3	E-ZPass Transactions, Non-Revenue Transactions and Image Transactions (see sections 3.2.1 through 3.2.3 below) are the only allowable forms of this electronic record.
TS-05 Requirement #3.2-4	The Toll System shall cross-reference each E-ZPass Transaction, Non-Revenue Transaction and Image Transaction to, and index each such transaction with, all respective troubleshooting data and store such troubleshooting data for ninety (90) days.
TS-05 Requirement #3.2-5	The Toll System shall cross-reference each E-ZPass Transaction, Non-Revenue Transaction and Image Transaction to, and index each such transaction with, all respective Digital Video Audit video images (described in section 3.7 below).
TS-05 Requirement #3.2-6	All E-ZPass Transaction, Non-Revenue Transaction and Image Transaction record information shall be identical to that displayed by the Toll System's Digital Video Audit function.

3.2.1. E-ZPass Transaction Records

Contract Criteria	
TS-05 Requirement #3.2.1-1	The ORT Zone Subsystem shall create the E-ZPass Transaction form of this electronic record whenever: • A vehicle passes through an ORT Zone Subsystem equipped with a properly mounted and functioning E-ZPass transponder, and • The VDOT transponder status file reflects a status of "valid" or "low balance" for such E-ZPass transponder, and • The vehicle classification data programmed into the transponder is equivalent to the vehicle class determined by the Toll System (see section 3.4 below).

Contract Criteria	
TS-05 Requirement #3.2.1-2	Each E-ZPass Transaction record shall contain the axle count and other vehicle classification data (described in section 3.4 below).
TS-05 Requirement #3.2.1-3	Each E-ZPass Transaction record shall contain all of the AVI data (see section 3.6 below) from the vehicle's E-ZPass transponder.
TS-05 Requirement #3.2.1-4	Each E-ZPass Transaction record shall contain the transponder status file identifier used to determine the "valid" or "low balance" status.
TS-05 Requirement #3.2.1-5	Each E-ZPass Transaction record shall cross-reference to, and be indexed with, the Digital Video Audit video images (described in section 3.7 below).

The ORT Zone Subsystem will transmit E-ZPass Transaction records to the Host Subsystem as described in section 3.3.2 below.

3.2.2. Non-Revenue Transactions

Contract Criteria	
TS-05 Requirement #3.2.2-1	The ORT Zone Subsystem shall create the Non-Revenue Transaction form of this electronic record whenever: • A vehicle passes through an ORT Zone Subsystem equipped with a properly mounted and functioning E-ZPass transponder, and • The transponder status file (see section 3.3.2 below) reflects a status of "non-revenue" for such E-ZPass transponder
TS-05 Requirement #3.2.2-2	Each Non-Revenue Transaction record shall contain the axle count and other vehicle classification data (described in section 3.4 below).
TS-05 Requirement #3.2.2-3	Each Non-Revenue Transaction record shall contain all of the AVI data (see section 3.6 below) from the vehicle's E-ZPass transponder.
TS-05 Requirement #3.2.2-4	Each Non-Revenue Transaction record shall identify the transponder status file used to determine the "non-revenue" status.
TS-05 Requirement #3.2.2-5	Each Non-Revenue Transaction record shall cross-reference to, and be indexed with, the Digital Video Audit video images (described in section 3.7 below).
TS-05 Requirement #3.2.2-6	The Toll System shall store Non-Revenue Transactions in the same manner as E-ZPass Transactions.

The ORT Zone Subsystem will transmit Non-Revenue Transaction records to the Host Subsystem as described in section 3.3.2 below.

3.2.3. Image Transactions

Contract Criteria	
TS-05 Requirement #3.2.3-1	The ORT Zone Subsystem shall create the Image Transaction form of this electronic record in all other cases.
TS-05 Requirement #3.2.3-2	Each Image Transaction record shall contain the axle count and other vehicle classification data (described in section 3.4 below).
TS-05 Requirement #3.2.3-3	Each Image Transaction record shall contain the full name of all license plate image files, including the license plate region of interest image file, showing the subject vehicle's passage (as described in section 3.5 below).
TS-05 Requirement #3.2.3-4	Each Image Transaction record shall contain all of the AVI data (see section 3.6 below) from any properly mounted and functioning E-ZPass transponder in the vehicle.
TS-05 Requirement #3.2.3-5	Each Image Transaction record shall identify the transponder status file in use at the ORT zone location when the Image Transaction was created.
TS-05 Requirement #3.2.3-6	Each Image Transaction record shall identify the transponder's status (e.g. lost/stolen) in such transponder status file.
TS-05 Requirement #3.2.3-7	Each Image Transaction record shall cross-reference to, and be indexed with, the Digital Video Audit video images (described in section 3.7 below).
TS-05 Requirement #3.2.3-8	Each Image Transaction record shall contain the transponder status file identifier used to determine transponder status when a properly mounted and functioning E-ZPass transponder is in the vehicle.

The ORT Zone Subsystem will transmit Image Transaction records to the Host Subsystem (as described in section 3.3.2 below) and the associated violation image files to the VDOT E-ZPass Customer Service Center (as described in section 3.3.3 below).

3.2.4. Other Transactions

The ORT Zone Subsystem shall not create or transmit ACM Transaction, Manual ISF Transaction, ID Card Transaction forms of the electronic record.

3.3. Zone Controller

Contract Criteria	
TS-05 Requirement #3.3-1	All electronic record processing (described in section 3.2 above) shall be performed on zone controllers.
TS-05 Requirement #3.3-2	The ORT Zone Subsystem shall provide a zone controller at each location specified in section 2 above.

3.3.1. Fault Tolerance

Contract Criteria	
TS-05 Requirement #3.3.1-1	Each zone controller shall be a fully redundant configuration such that when any hardware element or process on the primary controller fails or degrades, the secondary controller shall automatically assume the functions of the primary controller.
TS-05 Requirement #3.3.1-2	Each zone controller shall provide for an Authority user(s) to manually and remotely failover the active controller to and from the primary controller to the secondary controller.
TS-05 Requirement #3.3.1-3	Each zone controller shall cause the Host Subsystem MOMS function to log, store and issue an alert immediately upon each such automatic failover and each such manual failover.
TS-05 Requirement #3.3.1-4	Each zone controller shall execute all such automatic failovers with no loss of E-ZPass Transaction records, Non-Revenue Transaction records, Image Transaction records or MOMS data and such processing shall not require the restart of any Toll System elements or manual intervention.
TS-05 Requirement #3.3.1-5	Each zone controller shall have RAID 1 or RAID 5 storage configured to automatically switch-over and continue operating without degradation of performance or loss of data in the event of a failure in any disk drive.
TS-05 Requirement #3.3.1-6	Such RAID storage shall allow failed drives to be replaced and rebuilt while the zone controller is fully operational and processing traffic with no degradation in performance.
TS-05 Requirement #3.3.1-7	Upon start up, each zone controller shall perform a self-diagnostics test to ensure full Toll System function and performance and cause the Host Subsystem's MOMS function (see the TS-04 document) to log, store and send an alert in the event of any failure or degradation in performance.

Contract Criteria	
TS-05 Requirement #3.3.1-8	Each zone controller shall provide an automated means of synchronizing the zone controller with the Host Subsystem in all scenarios including but not limited to replacement of any zone controller, loss of any communications and catastrophic loss of any controller(s) where data is not retrievable from the ORT Zone Subsystem location.
TS-05 Requirement #3.3.1-9	Each zone controller shall proactively obtain all (manufacturer specified) COTS hardware and software status information of each ORT Zone Subsystem element no less often than every five minutes and cause the Host Subsystem's MOMS function to log, store and send an alert in the event of any element failure or degradation in performance.
TS-05 Requirement #3.3.1-10	Each zone controller shall store all MOMS records (for the ORT zone where it's installed) locally until such time as those records are received and safely stored on the Host Subsystem.

3.3.2. Communication With Host Subsystem

Contract Criteria	
TS-05 Requirement #3.3.2-1	Each zone controller shall receive all transponder status file information from the Host Subsystem as specified in the TS-04 document.
TS-05 Requirement #3.3.2-2	Each zone controller shall cause the Host Subsystem's MOMS function (see the TS-04 document) to log, store and send an alert whenever a transponder status file is received, updated, replaced or activated on a zone controller.
TS-05 Requirement #3.3.2-3	Each zone controller shall cause the Host Subsystem's MOMS function to log, store and send an alert each time a transponder status file is not updated or replaced within a given time period, where such time period shall be configurable on the Toll System by the Authority.
TS-05 Requirement #3.3.2-4	Each zone controller shall cause the Host Subsystem's MOMS function to log, store and send an alert each time a transponder status file is received in un-useable form or a replacement file varies from the size of its predecessor by 3% or more.
TS-05 Requirement #3.3.2-5	This log shall include the update or replacement transponder status file's unique identifier; the time and date it was successfully received from the Host Subsystem; the first electronic record (see section 3.2 above) number, time and date where it was used to create an electronic record; the last electronic record number, time and date where it was used before being replaced; and the unique identifier of the update that replaced it.
TS-05 Requirement #3.3.2-6	In 100% of all cases, each zone controller shall use a transponder status file for all related activities starting five (5) minutes or less after it is received from the Host Subsystem. Use of this transponder file shall continue until the next transponder status file is ready for use at this location.

Contract Criteria	
TS-05 Requirement #3.3.2-7	The ORT Zone Subsystem shall transmit all Powhite Parkway ORT zone electronic records directly to the Host Subsystem without using the Authority's wide area network or VDOT network.
TS-05 Requirement #3.3.2-8	The ORT Zone Subsystem shall transmit all Downtown Expressway ORT zone electronic records to the Host Subsystem via the Authority's wide area network demarcation point at the Downtown Expressway plaza building.
TS-05 Requirement #3.3.2-9	Each zone controller shall complete and forward 100% of all E-ZPass Transactions, all Non-Revenue Transactions and all Image Transactions (see sections 3.2.1, 3.2.2 and 3.2.3 above) to the Host Subsystem and log such transmission. Note that certain types of these electronic records need to arrive at the VDOT E-ZPass Customer Service Center within the timeframe specified in the TS-03 document and the KPIs.
TS-05 Requirement #3.3.2-10	Each zone controller shall cause the Host Subsystem MOMS function (see the TS-04 document) to log, store and send an alert each time a transaction record is not sent within a given time period, where such time period shall be configurable on the Toll System by the Authority.
TS-05 Requirement #3.3.2-11	The Toll System shall provide for manual on-site loading of transponder status lists from the Host Subsystem to a laptop computer or similar portable device to the ORT Zone Subsystem at each ORT zone location. The Toll System shall assess the likely usability of these files and, if positive, begin using these files within ten (10) minutes of the laptop's or portable device's connection. The Toll System shall automatically synchronize and resume all list related functions when network connections are restored.
TS-05 Requirement #3.3.2-12	The Toll System shall provide for manual on-site loading of electronic records (see section 3.2 above) and license plate image files from the ORT Zone Subsystem at each ORT zone location to a laptop computer or similar portable device to the Host Subsystem. The Toll System shall automatically synchronize, flag these transactions as having been manually loaded and resume all related functions when network connections are restored.

3.3.3. Communication With VDOT E-ZPass CSC

Contract Criteria	
TS-05 Requirement #3.3.3-1	For all Image Transactions, the ORT Zone Subsystem shall successfully transmit 100% of all image files (described in section 3.5 below) to the VDOT E-ZPass Customer Service Center within four (4) hours of when the subject vehicle travelled through the ORT zone and such transmission shall comply with Appendix B-1 of the TS-04 document.
TS-05 Requirement #3.3.3-2	The ORT Zone Subsystem shall transmit all such Powhite Parkway ORT zone images directly to the VDOT E-ZPass Customer Service Center via the VDOT network demarcation point at the Powhite Parkway plaza building.

Contract Criteria	
TS-05 Requirement #3.3.3-3	The ORT Zone Subsystem shall transmit all such Downtown Expressway ORT zone images directly to the VDOT E-ZPass Customer Service Center via the VDOT network demarcation point at the Downtown Expressway plaza building.
TS-05 Requirement #3.3.3-4	All such image transmissions shall comply with the VDOT E-ZPass Customer Service Center interface specifications attached to the TS-04 document.
TS-05 Requirement #3.3.3-5	The ORT Zone Subsystem shall locally log, coordinate with and report to the Host Subsystem all such image transmissions and all associated attempts.

3.3.4. Communication With Authority Workstations

The ORT Zone Subsystem communicates directly with Authority workstations (for Digital Video Audit functions) as described in section 3.7 below.

3.4. Vehicle Classification

Vehicle class is based solely on the number of axles with tires touching the pavement. A copy of the Authority's toll rate schedule is provided in Appendix C of the TS-04 document.

Proposal Criteria
The Offeror shall include in their proposal a summary of no more than two (2) page-sides, detailing their proposed open road tolling vehicle classification solution.
This summary shall list the toll agencies and locations where they have installed similar vehicle classification. The Offeror shall describe any differences in that version or configuration from the one proposed here.

Contract Criteria	
TS-05 Requirement #3.4-1	The ORT Zone Subsystem shall measure the number of axles with tires touching the pavement, determine the associated vehicle class and determine the associated toll rate of every vehicle travelling through an ORT zone anywhere on the roadway, including the shoulder areas.
TS-05 Requirement #3.4-2	The ORT Zone Subsystem shall classify all such vehicles including but not limited to motorcycles, motorcycle/car hybrids, cars, vans, buses, straight trucks and tractor-trailers.
TS-05 Requirement #3.4-3	The ORT Zone Subsystem shall classify all such vehicles travelling at very low speed (i.e. "stop and go" traffic conditions), all such vehicle travelling at 100 miles per hour and all such vehicles travelling at any speed in between.
TS-05 Requirement #3.4-4	The ORT Zone Subsystem shall classify all such vehicles when there is at least three (3) feet of spacing between other vehicles using the same lane or shoulder.

Contract Criteria	
TS-05 Requirement #3.4-5	The ORT Zone Subsystem shall detect any vehicle towing a trailer(s) and treat the combination as a single vehicle.
TS-05 Requirement #3.4-6	The ORT Zone Subsystem shall detect any vehicle towing another vehicle and treat the combination as a single vehicle.
TS-05 Requirement #3.4-7	The ORT Zone Subsystem shall detect any vehicle carrying another vehicle(s) and treat the combination as a single vehicle.
TS-05 Requirement #3.4-8	The ORT Zone Subsystem shall detect any vehicle equipped with a snow plow, hitch mounted platform or hitch mounted bicycle carrier and treat the combination as a single vehicle.

The ORT Zone Subsystem is not required to:
- Classify vehicles based on dual tire detection
- Classify vehicles based on vehicle shape
- Measure vehicle speeds

3.5. Violation Image Capture

Proposal Criteria
The Offeror shall include in their proposal a summary of no more than two (2) page-sides, detailing their proposed image capture solution.
This summary shall describe all Toll System lighting elements related to the image capture function.
This summary shall describe the number of images per vehicle, image resolution, average file size, file type and format produced by the proposed image capture function.
This summary shall list the toll agencies and locations where the Offeror has installed similar lighting and image capture equipment. The Offeror shall describe any differences in that version or configuration from the cameras, lighting, triggering mechanism, level of redundancy, etc. proposed here.

Contract Criteria	
TS-05 Requirement #3.5-1	The ORT Zone Subsystem shall capture an electronic image of the rear license plate of each and every vehicle travelling through an ORT zone anywhere on the roadway, including the shoulder areas.

Contract Criteria	
TS-05 Requirement #3.5-2	Each such image shall: a) Be a color image, regardless of ambient lighting conditions b) Be in a digital image format that is widely used by consumers c) Show all full-height characters in the plate identifier (often referred to as the "plate number") field of the license plate with at least 10 pixels of resolution in the vertical direction d) Show the entire width of the license plate with at least 150 pixels of resolution in the horizontal direction e) Be fully suitable for manual review
TS-05 Requirement #3.5-3	The ORT Zone Subsystem shall associate each such image with the correct electronic record (see section 3.2 above) and only the correct electronic record.
TS-05 Requirement #3.5-4	The ORT Zone Subsystem shall capture an electronic (overview) image of the rear of the vehicle for each and every vehicle travelling through an ORT zone anywhere on the roadway, including the shoulder areas.
TS-05 Requirement #3.5-5	Each such (overview) image shall: a) Be a color image, regardless of ambient lighting conditions b) Be in a digital image format that is widely used by consumers
TS-05 Requirement #3.5-6	The ORT Zone Subsystem shall associate each such (overview) image with the correct electronic record (see section 3.2 above) and only the correct electronic record.
TS-05 Requirement #3.5-7	The ORT Zone Subsystem shall include but is not limited to the cameras, camera enclosures, camera enclosure climate control and equipment protection elements, camera lighting, camera triggering mechanism, light sensor and brightness adjustment and contrast adjustment mechanisms addressing each location's varying weather and ambient light conditions.
TS-05 Requirement #3.5-8	The ORT Zone Subsystem shall provide all image capture functions above and meet all performance requirements during: a) Concurrent operation of police radios, citizen band radios, mobile phones and other radio systems allowed or licensed by the FCC b) Concurrent operation of current or future roadside lighting and other electrically powered items c) Failure of any single camera d) Failure of any single (camera) lighting field replaceable unit e) Failure of any single (camera) triggering mechanism field replaceable unit f) Failure of any single (camera) light sensor g) Failure of any other single field replaceable unit including but not limited to server hardware, network switch, uninterruptible power supply, cable, etc.

Images are only transmitted for Image Transactions, as described in section 3.3.3 above.

3.5.1. Coverage Area

Contract Criteria	
TS-05 Requirement #3.5.1-1	The ORT Zone Subsystem shall provide images of all vehicles including but not limited to motorcycles, motorcycle/car hybrids (e.g. "trike", Spyder, Slingshot, etc.), cars, vans, buses, straight trucks and tractor-trailers.
TS-05 Requirement #3.5.1-2	The ORT Zone Subsystem shall provide images for all such vehicles travelling at very low speed (i.e. "stop and go" traffic conditions), all such vehicle travelling at 100 miles per hour and all such vehicles travelling at any speed in between.
TS-05 Requirement #3.5.1-3	The ORT Zone Subsystem shall provide images for all such vehicles travelling in any lane, straddling two lanes, any shoulder or straddling a lane and shoulder when there is at least three (3) feet of spacing between vehicles travelling on the same line.

3.5.2. Lighting

Contract Criteria	
TS-05 Requirement #3.5.2-1	The ORT Zone Subsystem shall provide all lighting necessary to meet the specified levels of performance, regardless of ambient conditions at the time of installation or in the future.
TS-05 Requirement #3.5.2-2	The ORT Zone Subsystem shall provide all image capture functions and meet all performance requirements during: a) Normal operation b) Excessive glare conditions c) Any other ambient lighting conditions d) Any weather conditions
TS-05 Requirement #3.5.2-3	The ORT Zone Subsystem shall automatically adjust, with or without traffic, its cameras to accommodate all lighting and weather conditions to maintain adequate brightness and contrast settings.
TS-05 Requirement #3.5.2-4	The ORT Zone Subsystem shall provide all lighting necessary to meet the specified levels of performance, regardless of ambient conditions at the time of installation or in the future.
TS-05 Requirement #3.5.2-5	Such lighting shall not distract motorists travelling in either direction and the Authority shall solely determine whether lighting meets this criterion.
TS-05 Requirement #3.5.2-6	Such lighting shall not disturb nearby property owners and the Authority shall solely determine whether lighting meets this criterion.

3.6. Automatic Vehicle Identification (AVI)

Proposal Criteria
The Offeror shall include in their proposal a summary of no more than two (2) page-sides, detailing their proposed AVI solution.
This summary shall include a sketch of each different ORT zone showing AVI antenna type(s), quantities and how they will be arranged and connected to AVI readers.
This summary shall list the toll agencies and locations where the Offeror has interfaced to Kapsch Janus MPR2 AVI readers for open road tolling zones accepting E-ZPass. The Offeror shall describe any differences in the version or configuration from the system proposed here.
This summary shall list the toll agencies and locations where the Offeror has used Kapsch Janus MPR2 AVI readers to write data onto motorists' transponders at highway speeds.

Contract Criteria	
TS-05 Requirement #3.6-1	The Contractor shall integrate, furnish and install all Kapsch Janus MPR2 readers, Kapsch IAG antennas and all associated AVI equipment and cabling and mounting hardware to achieve the following functions at the ORT zone locations specified in section 2 above.
TS-05 Requirement #3.6-2	The Contractor shall synchronize these new AVI readers with the existing (Kapsch Badger) AVI readers at nearby traditional lanes without perturbing the existing reader cabling or "firing sequence".
TS-05 Requirement #3.6-3	The Contractor shall tune and certify that these new AVI readers operate in accordance with all E-ZPass Group performance requirements at each such ORT zone location.
TS-05 Requirement #3.6-4	The ORT Zone Subsystem shall read the E-ZPass AVI transponder of each and every vehicle travelling through an ORT zone anywhere on the roadway, including the shoulder areas, when such vehicle is equipped with a functional and properly mounted transponder.
TS-05 Requirement #3.6-5	The ORT Zone Subsystem shall accurately read and maintain a record of all transponders where more than one E-ZPass transponder is present in a vehicle and associate this information with only the correct record (see section 3.2 above).
TS-05 Requirement #3.6-6	This AVI function shall accurately read and maintain a record of any interoperable but non-E-ZPass transponder(s) present in a vehicle and associate this information with only the correct record (see section 3.2 above).
TS-05 Requirement #3.6-7	The ORT Zone Subsystem shall buffer transponder reads in the E-ZPass AVI reader assembly when communications with the zone controller is unavailable and transmit those reads to the zone controller when communications is restored.
TS-05 Requirement #3.6-8	The ORT Zone Subsystem shall write ORT zone identifier, time and date of passage; and vehicle location(s) within the zone onto 99.9 percent (99.9%) of all such transponders.

Contract Criteria	
TS-05 Requirement #3.6-9	The ORT Zone Subsystem shall accurately write to all such transponders where more than one E-ZPass transponder is present in a vehicle.
TS-05 Requirement #3.6-10	Each ORT Zone Subsystem location shall be tuned such that the transponders of vehicles travelling on the shoulder and roadway serving the opposite direction of travel are not reported by the AVI function.
TS-05 Requirement #3.6-11	Each ORT Zone Subsystem location shall be tuned such that false reads (e.g. cross lane reads) are less than 0.001 percent (0.001%) of all transactions in all cases.
TS-05 Requirement #3.6-12	Each ORT Zone Subsystem location shall be tuned such that the transponders of vehicles travelling on the shoulder and roadway serving the opposite direction of travel are not written to by the AVI function.
TS-05 Requirement #3.6-13	The ORT Zone Subsystem shall provide such transponder reads and writes for all vehicles including but not limited to motorcycles, motorcycle/car hybrids (e.g. trike, Spyder, Slingshot, etc.), cars, vans, buses, straight trucks and tractor-trailers.
TS-05 Requirement #3.6-14	The ORT Zone Subsystem shall provide such transponder reads and writes for all such vehicles travelling at very low speed (i.e. "stop and go" traffic conditions), all such vehicle travelling at 100 miles per hour and all such vehicles travelling at any speed in between.
TS-05 Requirement #3.6-15	The ORT Zone Subsystem shall provide such transponder reads and writes for all such vehicles travelling in any ORT zone lane, shoulder or straddling condition.

TS-05 Requirement #3.6-16	Each ORT Zone Subsystem location shall provide such transponder reads and writes for all such E-ZPass transponders including those mounted in accordance with the transponder manufacturer's recommendations:
	    a) To the interior of the windshield
	    b) At the top of the vehicle's front license plate
	    c) To the vehicle's roof, on the centerline and a minimum of three inches (3") from the front edge of the roof

TS-05 Requirement #3.6-17	This AVI function shall meet all of the technical and operational requirements of the E-ZPass Group that are in effect on March 1, 2017 and be in accordance with the written recommendation of the original equipment manufacturer specific to each of the ORT zones listed in section 2 above.
TS-05 Requirement #3.6-18	The Contractor shall only use JANUS MPR2 (IAG protocol) AVI reader backplanes and IAG-3 lane kits specified in the E-ZPass Group contract for all AVI function in Factory Acceptance Test activities. No other backplane or lane kit elements are permitted.
TS-05 Requirement #3.6-19	The Contractor shall tune and certify that all AVI equipment used for Factory Acceptance Test is operating in accordance with E-ZPass Group performance requirements.

The Authority will issue a letter allowing the Contractor to purchase E-ZPass Group compliant backplane elements, lane kit elements and related services from the original equipment manufacturer (i.e. Kapsch).

3.7. Digital Video Audit

Contract Criteria	
TS-05 Requirement #3.7-1	The ORT Zone Subsystem shall continuously record video images of each ORT zone from locations both upstream and downstream of each gantry set. The Contractor shall propose these locations and develop all related design prior to the Midpoint Design Review Milestone, subject to the Authority's approval.
TS-05 Requirement #3.7-2	Such recording shall be made whether there are vehicles in the ORT zone or not.
TS-05 Requirement #3.7-3	Such Digital Video Audit function shall include but is not limited to two (2) or more high resolution color cameras at each of the ORT zone locations specified in section 2 above (six cameras total), all associated camera triggering, ambient lighting measurement and supplemental lighting.
TS-05 Requirement #3.7-4	Such cameras provide an overall view of each ORT zone location and provide an Authority user(s) with a view of each lane, each shoulder and each vehicle traveling anywhere on those lanes and shoulders.
TS-05 Requirement #3.7-5	Such cameras shall provide video images of these views clearly at all levels of ambient light including but not limited to zero lux.
TS-05 Requirement #3.7-6	Video images shall include an overlay of data fully synchronized to display an image of each vehicle with the associated electronic record (see section 3.2 above) and the underlying toll system sensor data.
TS-05 Requirement #3.7-7	For viewing such video images, the ORT Zone Subsystem shall provide a browser-based Graphical User Interface (GUI) application accessible to an Authority user(s) through any workstation with a common browser connected to the Authority's network.
TS-05 Requirement #3.7-8	This GUI application shall provide for an Authority user(s) to search video by time and location.
TS-05 Requirement #3.7-9	This GUI application shall provide for an Authority user(s) to search video by electronic record number (see section 3.2 above).
TS-05 Requirement #3.7-10	These video images and all other data of the Digital Video Audit function shall be read-only and the Toll System shall prevent all changes and alterations.

Coverage area and vehicle type requirements for the Digital Video Audit function are the same as those specified for the violation image function in section 3.5.1 above.

Lighting requirements for the Digital Video Audit function are the same as those specified for violation image function in section 3.5.2 above.

3.8. MOMS

Contract Criteria	
TS-05 Requirement #3.8-1	The ORT Zone Subsystem shall cause the Host Subsystem MOMS function to log, store and send an alert in the event the operating mode (see section 3.1 above) changes.
TS-05 Requirement #3.8-2	The ORT Zone Subsystem shall cause the Host Subsystem MOMS function to log, store and send an alert in the event of any ORT Zone Subsystem element failure or degradation in performance.
TS-05 Requirement #3.8-3	The Toll System shall provide for an Authority user(s) to set comprehensive threshold values for issuing alerts such performance degradation including but not limited to message queues and system process backlogs.

3.9. Capacity

Traffic projections are provided as Appendix D of the TS-04 document.

Contract Criteria	
TS-05 Requirement #3.9-1	The ORT Zone Subsystem at each ORT zone location shall reliably process 2,200 vehicles per lane per hour for an indefinite period.
TS-05 Requirement #3.9-2	The ORT Zone Subsystem at each ORT zone location shall operate in a stand-alone mode for a minimum of thirty (30) days without manual intervention if the network connection to the Host Subsystem and/or VDOT E-ZPass Customer Service Center is unavailable.
TS-05 Requirement #3.9-3	The ORT Zone Subsystem at each location shall operate indefinitely without the Authority's network when the manual data on-load and data off-load mechanism described in section 3.3.2 above is utilized.
TS-05 Requirement #3.9-4	Each item described in sections 3.9.1 through 3.9.5 below shall be stored in a manner that makes it easy for an Authority user(s) to search for it, locate it, display it, make a copy of it in a file format that is commonly used commercially and email it in this format.
TS-05 Requirement #3.9-5	When storage capacity reaches a configurable utilization percentage (for example 80%), the ORT Zone Subsystem shall cause the Maintenance Online Management Subsystem to log, store and issue an alert.
TS-05 Requirement #3.9-6	The ORT Zone Subsystem at each ORT zone location shall provide sufficient storage and perform the processing described above for all projected traffic volumes specified in Appendix D of the TS-04 document.

3.9.1. Transponder Status Files

Host Subsystem processing of transponder status information from the VDOT E-ZPass Customer Service Center is described in the TS-04 document.

Contract Criteria	
TS-05 Requirement #3.9.1-1	Each zone controller shall store all transponder status information at the time it is received from the Host Subsystem and for at least seven (7) days after it is replaced.
TS-05 Requirement #3.9.1-2	Upon start up, each such zone controller shall query the Host Subsystem to verify that the zone controller has the latest transponder status file and shall cause the Host Subsystem's MOMs function to log, store and send an alert each time a zone controller starts up without the latest transponder status file and is unable to obtain such file within ten (10) minutes of commencing start up.
TS-05 Requirement #3.9.1-3	Each such zone controller shall receive and store the updated status for individual E-ZPass transponders when such status is transmitted as an incremental update by the VDOT E ZPass Customer Service Center to the Host Subsystem.

Additional performance requirements and Key Performance Indicators for placing transponder status information into revenue service are detailed in the TS-02 document.

3.9.2. Toll Rate Schedules

The toll rate schedule is provided as Appendix C of the TS-04 document.

Contract Criteria	
TS-05 Requirement #3.9.2-1	Each zone controller shall always store the latest toll rate schedule from the Host Subsystem, the pending toll rate schedule (if any) from the Host Subsystem and the two toll rate schedules most recently used in revenue service and since replaced.
TS-05 Requirement #3.9.2-2	Upon start up, each such zone controller shall query the Host Subsystem to verify that the zone controller has the latest toll rate schedule and shall cause the Host Subsystem's MOMs function to log, store and send an alert each time a zone controller starts up without the latest toll rate schedule and is unable to obtain such schedule within ten (10) minutes of commencing start up.
TS-05 Requirement #3.9.2-3	Thereafter, each such zone controller shall receive and store all updates of the toll rate schedule from the Host Subsystem and place each such schedule into revenue service at the exact date and time specified by the Authority user that generated the toll rate schedule.

3.9.3. Authority User List

Contract Criteria	
TS-05 Requirement #3.9.3-1	Each zone controller shall always store the latest list of Authority users from the Host Subsystem and all of their respective Toll System permissions.
TS-05 Requirement #3.9.3-2	Upon start up, each such zone controller shall query the Host Subsystem to verify that the zone controller has such list and shall cause the Host Subsystem's MOMs function to log, store and send an alert each time a zone controller starts up and is unable to obtain such list, or confirm it has such list, within ten (10) minutes of commencing start up.

3.9.4. ID Card List

Use of the ID cards is not required to log into, access or operate a zone controller. User ID and password are sufficient.

3.9.5. Transaction Data and Image Files

Contract Criteria	
TS-05 Requirement #3.9.5-1	Each zone controller shall store all electronic records (see section 3.2 above) for at least thirty (30) days.
TS-05 Requirement #3.9.5-2	The ORT Zone Subsystem shall cause the Host Subsystem to log and report when each such electronic record was successfully transmitted to the Host Subsystem (as described in section 3.3.2 above).
TS-05 Requirement #3.9.5-3	The ORT Zone Subsystem shall cause the Host Subsystem to log and report when the associated license plate image files were successfully transmitted to the VDOT E-ZPass Customer Service Center (as described in section 3.3.3 above).
TS-05 Requirement #3.9.5-4	Each zone controller shall have sufficient storage to store all license plate image files, including license plate region of interest image files, for at least thirty (30) days including but not limited to any images generated by redundant cameras, multiple image triggers per vehicle or any combination thereof..
TS-05 Requirement #3.9.5-5	Each zone controller shall automatically erase each license plate image file after a given time period following its creation, where such given time period is configurable by an Authority user(s) and ranges from seven (7) days to ninety (90) days.

3.10. UPS

Contract Criteria	
TS-05 Requirement #3.10-1	The Contractor shall furnish and install a UPS(s) to power and protect all elements of the ORT Zone Subsystem at each location.
TS-05 Requirement #3.10-2	Each zone controller shall shut down its elements gracefully when a user configurable threshold of its respective battery power has been reached and notify the Host System MOMS function and cause it to issue an alert just prior to such shutdown.

UPS specifications are provided in the TS-03 document.

4. SYSTEM DESIGN DOCUMENTATION

The Contractor shall evaluate the Authority's current operations, interaction with the current toll system and associated processes.   The Contractor shall then document the associated ORT Zone Subsystem business rules in the System Design Requirements document as described in the TS-01 document.

Contract Criteria	
TS-05 Requirement #4-1	The SDD document shall detail all hardware and software that implements the functions in section 3 above.
TS-05 Requirement #4-2	The SDD document shall detail all COTS hardware and COTS software in the ORT Zone Subsystem, all status information specified by the manufacturer for each and how this information is monitored by the zone controller function.
TS-05 Requirement #4-3	The SDD document shall detail all fault tolerance designed into the ORT Zone Subsystem and how function and performance are maintained in the event of any element failure or degradation in performance.
TS-05 Requirement #4-4	The SDD document shall detail how the ORT Zone Subsystem causes the Host Subsystem MOMS function to log, store and send an alert in the event of any element failure or degradation in performance.
TS-05 Requirement #4-5	The SDD document shall detail the guaranteed transmission protocol(s) between all functions in section 3 above and how such communications are stored, searched, displayed, copied and e-mailed.
TS-05 Requirement #4-6	The SDD document shall detail zone controller function in those cases where a vehicle partially or fully enters the ORT zone and then partially or fully backs up through the ORT zone.
TS-05 Requirement #4-7	The SDD document shall detail the hardware and software used to implement all other ORT Zone Subsystem functions.

Contract Criteria	
TS-05 Requirement #4-8	The SDD document shall detail the phase down of function for the existing toll equipment and the phase up of function on the new.
TS-05 Requirement #4-9	The SDD document shall include the electromagnetic profile for each ORT Zone Subsystem location (as described in the TS-03 document).
TS-05 Requirement #4-10	The Midpoint Design Review Submittal of the SDD document shall detail all of the design items required prior to the Midpoint Design Review Milestone above.
TS-05 Requirement #4-11	The Test Plan and the Detailed Test Procedures documents shall both state that tuning and certification of the Automatic Vehicle Identification equipment (see section 3.6 above) shall be successfully completed prior to the commencement of Factory Acceptance Test and prior to any Revenue Service Acceptance Test activities at any ORT Zone Subsystem location.
TS-05 Requirement #4-12	The Detailed Test Procedures document shall state that tuning and certification of the Automatic Vehicle Identification equipment (see section 3.6 above) shall be successfully completed prior to the commencement of any Revenue Service Acceptance Test activities at any ORT Zone Subsystem location.
TS-05 Requirement #4-13	The Detailed Test Procedures document shall fully describe the testing of all functions in section 3 above.
TS-05 Requirement #4-14	Setup, configuration, tuning, problem determination and correction of all functions specified in section 3 above shall be fully detailed in the System Maintenance Manual.

Other SDD document and milestone requirements are detailed in the TS-01 document.

5. HARDWARE AND INSTALLATION

Proposal Criteria
The Offeror shall include in their proposal a summary of no more than two (2) page-sides, detailing their proposed installation sequence in a single ORT zone.
This summary shall describe the Offeror's experience working with the AVI equipment required by the E-ZPass Group and their working relationship with its manufacturer(s).
This summary shall list the toll agencies and locations where the Offeror has interfaced to Kapsch Janus MPR or MPR2 AVI readers for open road tolling zones accepting E-ZPass. The Offeror shall describe any differences in the version or configuration from the system proposed here.
This summary shall detail the proposed phase down and phase up of functions at each zone and the timing of each step, considering the Maintenance of Traffic limitations.

Contract Criteria	
TS-05 Requirement #5-1	Re-use of any element from the existing open road tolling system is not allowed and the Contractor shall remove, scrap for zero value and dispose of all such elements including but not limited to toll system equipment mounted on the gantry and elsewhere; pavement loops and sealant; cabling; exposed conduit; mounting hardware; and enclosures at each of the locations described in section 2 above.
TS-05 Requirement #5-2	The Contractor's installation sequence shall not rely on any assistance or accommodation from the firms maintaining the current toll system at the open road toll zones.
TS-05 Requirement #5-3	The Contractor shall furnish and install lightning and surge protection on all power and signal lines connected to Toll System equipment mounted on the gantries.
TS-05 Requirement #5-4	The Contractor shall furnish and install a UPS to feed all Toll System equipment that is gantry mounted and uses 120 VAC power.
TS-05 Requirement #5-5	The Contractor shall provide all maintenance of traffic for all removal and installation work at the ORT Zone Subsystem locations.

Additional requirements for hardware and installation are detailed in the TS-03 document.

6. INFRASTRUCTURE DOCUMENTATION

The Contractor evaluated the ORT pavement and gantry design and existing conditions prior to submitting the ORT Pavement and Gantry Statement Form with their proposal.

Contract Criteria	
TS-05 Requirement #6-1	The Detailed Design Drawings, Detailed Design Calculations, Detailed Design Specifications and Shop Drawings shall fully describe installation of all enclosures and the available spare capacity, cooling load and equipment operating temperatures at the specified ambient conditions in each.
TS-05 Requirement #6-2	The Detailed Design Drawings, Detailed Design Calculations, Detailed Design Specifications and Shop Drawings shall fully describe installation of all pavement mounted sensors and all associated cabling and conduit.
TS-05 Requirement #6-3	The Detailed Design Drawings, Detailed Design Calculations, Detailed Design Specifications and Shop Drawings shall fully describe installation of all Digital Video Audit elements including but not limited to cameras and lighting and all associated cabling and conduit.
TS-05 Requirement #6-4	The Detailed Design Drawings, Detailed Design Calculations, Detailed Design Specifications and Shop Drawings shall fully describe installation of all other Toll System elements including but not limited to other equipment, conduit, mounting hardware and cabling.

Contract Criteria	
TS-05 Requirement #6-5	The Detailed Design Drawings, Detailed Design Calculations, Detailed Design Specifications and Shop Drawings shall fully describe all lighting furnished by the Contractor and assess its suitability per the requirements specified in section 3.5.2 above.
TS-05 Requirement #6-6	The Midpoint Design Review Submittal of the Detailed Design Drawings, Detailed Design Calculations, Detailed Design Specifications and Shop Drawings shall fully describe all of the design items required prior to the Midpoint Design Review Milestone above.

Other requirements for the Engineer Of Record, infrastructure documentation and milestones are described in the TS-01 document.

TS-05: APPENDIX A

Kapsch Janus MPR II Interface Control Document

This document will be provided at a later time.

TS-06

Tolling Specification #06: Traditional Lane Subsystem

TOLLING SPECIFICATION #06: TRADITONAL LANE SUBSYSTEM

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DISPOSITION OF EXISTING EQUIPMENT   APPENDIX A
AND REQUIRED TOLL SYSTEM FUNCTION
(BY LOCATION)

Wide area network demarcation points are provided as Appendix A of the TS-03 document and reference drawings for the plaza and ramp locations are provided as Appendix B there.

The toll rate schedule is provided as Appendix C of the TS-04 document and traffic projections are provided as Appendix D there.

1. ACRONYMS & KEY TERMS

Acronyms and key terms are defined in the TS-01 document.

2. LOCATIONS

Contract Criteria	
TS-06 Requirement #2-1	The Contractor shall integrate, furnish and install a complete Traditional Lane Subsystem providing the functions described below at each of the forty-six (46) single direction lanes and one (1) reversible lane described in Appendix A of this TS-06 document.

The traditional lane pavement, islands, booths and personnel tunnels (if any) provided by the Authority at these locations are detailed in the reference drawings provided in Appendix B of the TS-03 document.

3. SUBSYSTEM FUNCTION & PERFORMANCE

	Proposal Criteria
The Offeror shall include in their proposal a summary, of no more than one (1) page-side, listing their most recent experience installing traditional lanes equipped with Automatic Coin Machines and similar (major and minor) upgrade and replacement work within the last five years.	

Contract Criteria	
TS-06 Requirement #3-1	The Traditional Lane Subsystem shall be integrated with the Host Subsystem (described in the TS-04 document).
TS-06 Requirement #3-2	The Traditional Lane Subsystem shall be integrated with a primary and secondary network time protocol (NTP) server and these shall be the same as for all other Toll System elements.
TS-06 Requirement #3-3	The Traditional Lane Subsystem shall immediately recover from all instances of vehicles backing up through the lane and this activity shall not impact the detection and recording of other vehicles travelling in the subject lane or any other lane.
TS-06 Requirement #3-4	The Traditional Lane Subsystem shall associate each instance of an activity with the individual supervisor, maintenance person or member of the audit staff performing the activity.
TS-06 Requirement #3-5	The Traditional Lane Subsystem shall provide a web browser interface for a supervisor to log all plaza supervisor activities including but not limited to opening a supervisor shift, closing a supervisor shift, accidents, lane closures including the reason for same, maintenance calls made, maintenance actions taken, and all changes in the log made during the supervisor's shift.

Contract Criteria	
TS-06 Requirement #3-6	Such interface shall provide for a supervisor to edit the supervisor's log before closing their shift and prevent changes to such log after the shift is closed by the supervisor logging out.

Key Performance Indicators for subsystem availability are detailed in Appendix A of the TS-02 document.

3.1. Plaza Server

Note that the Authority's current operation method does not demand a 3-tier (Plaza Server) architecture.

3.2. Lane Controller

Contract Criteria	
TS-06 Requirement #3.2-1	The Contractor shall furnish and install lane controllers (48 units in total) such that each traditional lane described in section 2 above has its own dedicated lane controller.
TS-06 Requirement #3.2-2	All transaction processing (described in section 3.3 below) in a traditional lane shall be performed on its respective lane controller.
TS-06 Requirement #3.2-3	Upon start up, each lane controller shall query the Host Subsystem to verify that the lane controller has the latest configuration parameters and settings files, application software and any other information required to provide successful operation and shall cause the Host Subsystem's MOMs function to log, store and send an alert each time a lane controller starts up without these.

3.2.1. Transponder Status Files

	Proposal Criteria
The Offeror shall include in their proposal: a) A complete description of how "full replacement" and "individual transponder status updates" will be distributed b) A statement of whether a plaza server is or is not proposed at each plaza/ramp location c) A sketch-level calculation of the bandwidth required (between the Host Subsystem location and each plaza/ramp location) for the described transponder status distribution configuration and the resulting propagation delay.	

Contract Criteria	
TS-06 Requirement #3.2.1-1	Upon start up, each such lane controller shall query the Host Subsystem to verify that the lane controller has the latest transponder status file and shall cause the Host Subsystem's MOMs function to log, store and send an alert each time a lane controller starts up without the latest transponder status file and is unable to obtain such file within ten (10) minutes of commencing start up.
TS-06 Requirement #3.2.1-2	Thereafter, each such lane controller shall receive and store the latest status of all E-ZPass transponders (i.e. latest transponder status list), as compared to the VDOT E-ZPass Customer Service Center transponder status file received by the Host Subsystem.
TS-06 Requirement #3.2.1-3	Each such lane controller shall receive and store the updated status for individual E-ZPass transponders when such status is transmitted as an incremental update by the VDOT E ZPass Customer Service Center to the Host Subsystem.

Key Performance Indicators for transponder status file information are detailed in Appendix A of the TS-02 document.

3.2.2. Toll Rate Schedules

Contract Criteria	
TS-06 Requirement #3.2.2-1	The Toll System shall provide a web browser interface for an Authority user(s) to create new toll rate schedules; store such toll rate schedules on the Host Subsystem; and specify the date and time at which such toll rate schedules will be placed into revenue service from any workstation connected to the Authority's wide area network without special hardware or software. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.

Contract Criteria	
TS-06 Requirement #3.2.2-2	Each such toll rate schedule shall have one set of toll rates (based on vehicle class) when toll payments are made with coins and another corresponding set of toll rates when an E-ZPass transponder (with a status of "valid" or "low balance") is used. Coin toll rates may be different from the E-ZPass toll rates at the same location.
TS-06 Requirement #3.2.2-3	Upon start up, each such lane controller shall query the Host Subsystem to verify that the lane controller has the latest toll rate schedule and shall cause the Host Subsystem's MOMs function to log, store and send an alert each time a lane controller starts up without the latest toll rate schedule and is unable to obtain such schedule within ten (10) minutes of commencing start up.
TS-06 Requirement #3.2.2-4	Thereafter, each such lane controller shall immediately receive and store all updates of the toll rate schedule from the Host Subsystem and place each such schedule into revenue service at the exact date and time specified by the Authority user that generated the toll rate schedule.
TS-06 Requirement #3.2.2-5	Each lane controller shall assign toll rates to transaction records (see section 3.3 below) based on the latest toll rate schedule, lane location, vehicle class and method of payment. The Contractor shall develop the associated business rules and related details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.

3.2.3. Authority User List

Contract Criteria	
TS-05 Requirement #3.2.3-1	Each lane controller shall receive and store the latest list of Authority users from the Host Subsystem, their latest passwords and all of their respective Toll System permissions.
TS-05 Requirement #3.2.3-2	Upon start up, each such lane controller shall query the Host Subsystem to verify that the lane controller has such latest list and shall cause the Host Subsystem's MOMs function to log, store and send an alert each time a lane controller starts up without such list and is unable to obtain such list within ten (10) minutes of commencing start up.
TS-05 Requirement #3.2.3-3	Other than when it is in immediate and active use by a Toll System process(es), all Authority userids and each password stored in the Traditional Lane Subsystem shall be encrypted at all times.

3.2.4. ID Card List

Contract Criteria	
TS-05 Requirement #3.2.4-1	Each zone controller shall receive and store the latest list of ID cards and ID card log-in codes from the Host Subsystem and all of their respective Toll System permissions.
TS-05 Requirement #3.2.4-2	Upon start up, each such lane controller shall query the Host Subsystem to verify that the lane controller has such latest list and shall cause the Host Subsystem's MOMs function to log, store and send an alert each time a lane controller starts up without such list and is unable to obtain such list within ten (10) minutes of commencing start up.
TS-05 Requirement #3.2.4-3	Other than when it is in immediate and active use by a Toll System process(es), all ID card data and each ID card log-in code stored in the Traditional Lane Subsystem shall be encrypted at all times.

3.2.5. Fault Tolerance

Contract Criteria	
TS-06 Requirement #3.2.5-1	Each lane controller shall have RAID 1 or RAID 5 storage configured to automatically switch-over and continue operating without degradation of performance or loss of data in the event of a failure in any disk drive.
TS-06 Requirement #3.2.5-2	Such RAID storage shall allow failed drives to be replaced and rebuilt while the lane controller is fully operational and processing traffic with no degradation in performance.

Contract Criteria	
TS-06 Requirement #3.2.5-3	Critical elements of the Traditional Lane Subsystem shall provide responses to diagnostic messages. At a minimum, such critical elements shall include all subassemblies of the lane controller (see section 3.2 above) and, as defined in later sections of this TS-06 document: • Network communications equipment • Automatic vehicle identification reader • Automatic coin machine • Automatic gate • Manual lane terminal • Receipt printer • Automatic vehicle classification • Violation image capture • Digital video audit • UPS The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.2.5-4	Upon start up, each lane controller shall perform a self-diagnostics test to ensure full Toll System function and performance and cause the Host Subsystem's MOMS function (see the TS-04 document) to log, store and send an alert in the event of any failure or degradation in performance.
TS-06 Requirement #3.2.5-5	Each lane controller shall continuously poll the status of, receive diagnostic messages and immediately detect loss of communication with the Traditional Lane Subsystem equipment listed above. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.2.5-6	Each lane controller shall infer the health of all respective Traditional Lane Subsystem equipment, software and cabling from events. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.2.5-7	Each lane controller shall provide various degraded modes of operation upon the failure of certain equipment or subsystems and such degraded operations shall not waive, reduce or otherwise offset the Key Performance Indicators required by Appendix A of the TS-02 document. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.

Contract Criteria	
TS-06 Requirement #3.2.5-8	Wherever the Traditional Lane Subsystem recovers after reporting a degraded mode of operation or reporting a failure, the respective lane controller shall log the recovery and cause the Host Subsystem's MOMS function to log and issue an alert.
TS-06 Requirement #3.2.5-9	Upon entering any degraded mode of operation, the respective lane controller shall immediately cause the Host Subsystem's MOMS function to log and issue an alert.
TS-06 Requirement #3.2.5-10	After the degradation is repaired or otherwise resolved, the respective lane controller shall immediately cause the Host Subsystem's MOMS function to log and issue an alert.
TS-06 Requirement #3.2.5-11	Each lane controller shall provide an automated means of synchronizing all of its data and processes with the Host Subsystem in all scenarios including but not limited to replacement of any lane controller, loss of any communications and catastrophic loss of any controller(s) where data is not retrievable from the Traditional Lane Subsystem location. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.2.5-12	Each lane controller shall proactively obtain all (manufacturer specified) COTS hardware and software status information of each Traditional Lane Subsystem element no less often than every five minutes and cause the Host Subsystem's MOMS function to log, store and send an alert in the event of any element failure or degradation in performance.
TS-06 Requirement #3.2.5-13	Each lane controller shall store all MOMS records locally until such time as those records are received and safely stored on the Host Subsystem.
TS-06 Requirement #3.2.5-14	Each lane controller shall operate normally for a minimum of thirty (30) days whenever reliable communications with the Host Subsystem (see section 3.5.1 below) are unavailable.
TS-06 Requirement #3.2.5-15	The Toll System shall provide manual on-site loading of toll rate schedules and transponder status lists from the Host Subsystem to any laptop computer or similar portable device to each lane controller. The Toll System shall assess file integrity and other key file attributes (e.g. size, size relative to previous files, etc.) and, if positive, begin using these files within ten (10) minutes of the laptop's or portable device's connection. The Toll System shall automatically synchronize and resume all functions when communications are restored.
TS-06 Requirement #3.2.5-16	The Toll System shall provide manual on-site loading of electronic records (see section 3.3 below) and license plate image files from each lane controller to any laptop computer or similar portable device to the Host Subsystem. The Toll System shall automatically synchronize, flag these transactions and images as having been manually loaded so as not to resend them, but otherwise resume all functions, when communications are restored.

Contract Criteria	
TS-06 Requirement #3.2.5-17	When communications are interrupted and then restored, each lane controller shall immediately obtain all software updates, parameters, settings and other system critical information upon restoration and do so without degrading the performance of any AVI, ACM, AVC or booth equipment (described below).
TS-06 Requirement #3.2.5-18	When communications are interrupted and then restored, each lane controller shall transmit and receive any other backlog of information and messages, including but not limited to transactions and violation image files, and do so without degrading the performance of any AVI, ACM, AVC or booth equipment.

Host Subsystem monitoring of these communications and related activities are further detailed in the TS-04 document.

3.3. Transaction Processing

Contract Criteria	
TS-06 Requirement #3.3-1	Each lane controller shall create one and only one electronic record for each vehicle's passage through its respective traditional lane.

TS-06 Requirement #3.3-2	Each such electronic record shall contain the following:
	   a) The toll plaza and lane identifiers
	   b) The mode the lane controller was operating in (see section 3.4 below)
	   c) The date and time of the vehicle's passage
	   d) The method of payment
	   e) The "segment of duty" and "tour of duty" under which the electronic record was created
	
	The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.

TS-06 Requirement #3.3-3	All E-ZPass transponder data read from a vehicle in a traditional lane by the Kapsch AVI reader shall be assigned to the correct electronic record with an accuracy of 99.98% or better under all conditions.
TS-06 Requirement #3.3-4	For any lane equipped with an automatic coin machines (see section 3.7 below), all coin payment data from the automatic coin machine shall be assigned to the correct electronic record with an accuracy of 99.9% or better under all conditions.
TS-06 Requirement #3.3-5	Where a motorist makes an automatic coin machine payment from a vehicle equipped with a properly mounted and functioning "valid" E-ZPass transponder, the data from both payment methods shall be assigned to the correct (same) electronic record with an accuracy of 99.9% or better under all conditions. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.

Contract Criteria	
TS-06 Requirement #3.3-6	For lanes equipped with booth equipment (see section 3.9 below) and operating in Attended Mixed Mode (see section 3.4.2 below), each such electronic record shall contain all data that is entered into the manual lane terminal and all magnetic stripe card reader data entered for the vehicle's passage with an accuracy of 99.98% or better under all conditions.
TS-06 Requirement #3.3-7	For lanes equipped with automatic vehicle classification (see section 3.10 below), each such electronic record shall contain the measured number of vehicle axles with tires actually touching the pavement and the corresponding Authority vehicle class with an accuracy of 99.98% or better under all conditions.
TS-06 Requirement #3.3-8	Each such electronic record shall contain the toll amount charged and identify the toll rate schedule used in this determination. The Contractor shall develop business rules for determining the toll amount charged based on vehicle class data from automatic vehicle classification, vehicle class data from the E-ZPass transponder and from manual lane terminal input of vehicle class data by the toll collection attendant subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.3-9	Each such electronic record shall contain a cross-reference to, and be indexed with, the Digital Video Audit video images (described in section 3.13 below).
TS-06 Requirement #3.3-10	The ACM Transaction, Manual ISF Transaction, ID Card Transaction, E-ZPass Transaction, Non-Revenue Transaction and Image Transaction forms of the electronic record (as detailed below) are the only allowable forms.

The performance numbers above represent the Authority's requirement in specific sub-categories. Overall performance is specified in the Key Performance Indicators (see Appendix A of the TS-02 document) at the complete electronic record level and the percentages listed here will have no effect on the calculation of the Key Performance Indicators.

3.3.1. ACM Transaction
The following describes the ACM Transaction form of the electronic record described above.

Contract Criteria	
TS-06 Requirement #3.3.1-1	In Unattended Mixed Mode (see section 3.4.3 below), each lane controller shall create an ACM Transaction record whenever a vehicle that does not meet all of the requirements for an E-ZPass Transaction (see section 3.3.4 below) passes through the respective lane.

Contract Criteria	
TS-06 Requirement #3.3.1-2	In Attended Mixed Mode (see section 3.4.2 below), each lane controller shall create an ACM Transaction record whenever: • A vehicle that does not meet all of the requirements for an E-ZPass Transaction passes through the respective lane, and • The lane's toll collection attendant does not initiate a Manual ISF Transaction (see section 3.3.2 below) or an ID Card Transaction (see section 3.3.3 below).
TS-06 Requirement #3.3.1-3	In Attended Mixed Mode, the lane's manual lane terminal (see section 3.9.1 below) shall provide for the lane's toll collection attendant to declare and process any vehicle passage as an ACM Transaction, even when an E-ZPass transponder is read. Conditions for such processing include but are not limited to a vehicle having a transponder programmed for a 2-axle vehicle class and currently towing a trailer. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.3.1-4	In Attended Mixed Mode, the lane's manual lane terminal shall provide for the lane's toll collection attendant to enter the number of vehicle axles that they personally observe and report unusual occurrences (e.g. ambulance run-throughs) as part of the ACM Transaction record. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.3.1-5	In Attended Mixed Mode, the lane's receipt printer (see section 3.9.2 below) shall produce a receipt for the respective vehicle only upon the toll collection attendant's request. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.3.1-6	Each ACM Transaction record shall identify the quantities of each coin type deposited into the Automatic Coin Machine from the respective vehicle.
TS-06 Requirement #3.3.1-7	The Traditional Lane Subsystem shall cause the Host Subsystem to report ACM Transactions in three (3) categories based on whether the amount paid in coins specific to a vehicle's passage is less than, equal to or more than the toll amount stated in the Authority cash toll rate schedule for that vehicle. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.3.1-8	The Traditional Lane Subsystem shall cause the Host Subsystem to store and report the ACM vault in which each ACM Transaction's payment amount was stored.

3.3.2. Manual ISF Transaction

The following describes the Manual ISF Transaction form of the electronic record described in section 3.3 above.

Contract Criteria	
TS-06 Requirement #3.3.2-1	In Attended Mixed Mode (see section 3.4.2 below), the lane's manual lane terminal (see section 3.9.1 below) shall provide for the lane's toll collection attendant to declare and process any vehicle passage as a Manual ISF Transaction, provided the vehicle does not meet all of the requirements for an E-ZPass Transaction (see section 3.3.4 below).
TS-06 Requirement #3.3.2-2	When processing a Manual ISF Transaction, the lane's manual lane terminal shall provide for the lane's toll collection attendant to enter additional data into the Manual ISF Transaction record including but not limited to a vehicle description, the vehicle's license plate information and driver information. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.3.2-3	When processing a Manual ISF Transaction, the lane's receipt printer (see section 3.9.2 below) shall produce a payment due notice for the motorist and a copy for the Authority's records that is suitable for motorist signature. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.3.2-4	Each Manual ISF Transaction record shall identify the quantities of each coin type (if any) deposited into the Automatic Coin Machine from the respective vehicle.
TS-06 Requirement #3.3.2-5	The Traditional Lane Subsystem shall cause the Host Subsystem to store and report all Manual ISF Transactions.
TS-06 Requirement #3.3.2-6	The Traditional Lane Subsystem shall cause the Host Subsystem to store and report the ACM vault in which each Manual ISF Transaction's payment amount (if any) was stored.
TS-06 Requirement #3.3.2-7	The Traditional Lane Subsystem shall provide for an Authority user(s) to configure the Toll System such that it prints motorist payment due notices for every Manual ISF Transaction or disables all such printing.

3.3.3. ID Card Transaction

The following describes the ID Card Transaction form of the electronic record described in section 3.3 above.

Contract Criteria	
TS-06 Requirement #3.3.3-1	The Toll System shall provide a web browser interface for an Authority user(s) to manage all Authority issued ID cards and each ID card's status (e.g. valid) from any Authority workstation connected to the Authority's wide area network without special hardware or software.
TS-06 Requirement #3.3.3-2	The Toll System shall provide a web browser interface for an Authority user(s) to update information about the user to which each card is assigned from any Authority workstation connected to the Authority's wide area network without special hardware or software.
TS-06 Requirement #3.3.3-3	The Toll System shall store a current list of all valid ID cards in the lane controller of each lane where Booth Equipment (see section 3.9 below) is installed.
TS-06 Requirement #3.3.3-4	In Attended Mixed Mode (see section 3.4.2 below), the lane's manual lane terminal (see section 3.9.1 below) shall provide for the lane's toll collection attendant to declare and process any vehicle passage as an ID Card Transaction when a valid ID card is presented, even if an E-ZPass transponder is read. No E-ZPass Transaction (see section 3.3.4 below) will result where a vehicle's passage has been processed as an ID Card Transaction in this manner. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.3.3-5	The lane controller shall cause the Host Subsystem MOMS function to log and issue an alert whenever an ID Card Transaction is initiated and the ID card has a status other than "valid". The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.3.3-6	The Traditional Lane Subsystem shall provide for processing ID Card Transactions using either: • The card number and other information printed on the ID card, or • The information programmed onto the ID card's magnetic stripe.
TS-06 Requirement #3.3.3-7	Each ID Card Transaction record processed using just the lane's manual lane terminal shall contain the card number manually entered by the toll collection attendant.
TS-06 Requirement #3.3.3-8	Each ID Card Transaction record processed using the magnetic stripe card reader (see section 3.9.3 below) shall contain all data programmed into such card and the version of the ID card list used.

Contract Criteria	
TS-06 Requirement #3.3.3-9	The Traditional Lane Subsystem shall cause the Host Subsystem to store and report all ID Card Transactions.

3.3.4. E-ZPass Transaction

The following describes the E-ZPass Transaction form of the electronic record described in section 3.3 above.

Contract Criteria	
TS-06 Requirement #3.3.4-1	In E-ZPass Only Mode (see section 3.4.4 below), the respective lane controller shall create an E-ZPass Transaction record whenever: • A vehicle equipped with a properly mounted and functioning E-ZPass transponder passes through the respective traditional lane, and • The latest transponder status file (see section 3.5.1 below) reflects a status of "valid" or "low balance" for such E-ZPass transponder.
TS-06 Requirement #3.3.4-2	In Unattended Mixed Mode (see section 3.4.3 below), the respective lane controller shall create an E-ZPass Transaction record for the same conditions as stated above.
TS-06 Requirement #3.3.4-3	In Attended Mixed Mode (see section 3.4.2 below), the respective lane controller shall create an E-ZPass Transaction record whenever: • A vehicle equipped with a properly mounted and functioning E-ZPass transponder passes through any traditional lane, and • The latest transponder status file (see section 3.5.1 below) reflects a status of "valid" or "low balance" for such E-ZPass transponder, and • The lane's toll collection attendant does not declare the vehicle passage as an ACM Transaction or an ID Card Transaction, as described above.
TS-06 Requirement #3.3.4-4	Each E-ZPass Transaction record shall contain a copy of all of the transponder's on-board data (see section 3.6 below).
TS-06 Requirement #3.3.4-5	Each E-ZPass Transaction record shall identify the transponder status file used to determine the "valid" or "low balance" status at the time of the vehicle's passage.
TS-06 Requirement #3.3.4-6	Each E-ZPass Transaction record generated in Attended Mixed Mode shall contain the vehicle class data input by the toll collection attendant via the manual lane terminal (see section 3.9.1 below).
TS-06 Requirement #3.3.4-7	Each E-ZPass Transaction record generated in Attended Mixed Mode shall contain a time stamped log of all actions performed by the toll collection attendant on the manual lane terminal.
TS-06 Requirement #3.3.4-8	Each E-ZPass Transaction record shall cross-reference to, and be indexed with, the Digital Video Audit video images (described in section 3.13 below).

Contract Criteria	
TS-06 Requirement #3.3.4-9	The lane controller shall cause the Host Subsystem to store and report all E-ZPass Transactions after the lane controller transmits such electronic records as described in section 3.5.1 below.
TS-06 Requirement #3.3.4-10	In lanes without violation image capture (see section 3.12 below), the lane controller shall cause the Host Subsystem to: • Identify each E-ZPass Transaction record where the vehicle class programmed into the E-ZPass transponder is contrary to the automatic vehicle classification data (see section 3.10 below), and • Provide additional reports detailing and summarizing such discrepancy with links to the corresponding digital video audit files (see section 3.13 below.

Note that "lost/stolen" and "unissued" status E-ZPass transponders are always processed as Image Transactions (see section 3.3.6 below) where violation image capture is installed and as ACM transactions elsewhere.

3.3.5. Non-Revenue Transaction

The following describes the Non-Revenue Transaction form of the electronic record described in section 3.3 above.

Contract Criteria	
TS-06 Requirement #3.3.5-1	A lane controller shall create a Non-Revenue Transaction record whenever the respective traditional lane is operating in Attended Mixed Mode (see section 3.4.2 below): in Unattended Mixed Mode (see section 3.4.3 below); or in E-ZPass Only Mode (see section 3.4.4 below) and: • A vehicle equipped with a properly mounted and functioning E-ZPass transponder passes through a traditional lane, and • The latest transponder status file (see section 3.5.1 below) reflects a status of "non-revenue" for such E-ZPass transponder
TS-06 Requirement #3.3.5-2	Each Non-Revenue Transaction record shall contain a copy of all of the transponder's on-board data (see section 3.6 below).
TS-06 Requirement #3.3.5-3	Each Non-Revenue Transaction record shall identify the transponder status file used to determine the "non-revenue" status at the time of the vehicle's passage.
TS-06 Requirement #3.3.5-4	Each Non-Revenue Transaction record shall cross-reference to, and be indexed with, the Digital Video Audit video images (described in section 3.13 below).

3.3.6. Image Transaction

The following describes the Image Transaction form of the electronic record described in section 3.3 above.

Contract Criteria	
TS-06 Requirement #3.3.6-1	A lane controller shall create an Image Transaction record whenever the respective traditional lane has violation image capture (see section 3.12 below) installed; is operating in E-ZPass Only Mode (see section 3.4.4 below); and: • A vehicle passes through the lane without a properly mounted and functioning E-ZPass transponder, or • A vehicle equipped with a properly mounted and functioning E-ZPass transponder passes through the lane and the latest transponder status file (see section 3.5.1 below) reflects a status other than "valid", "low balance" or "non-revenue" for such transponder, or • A vehicle equipped with a properly mounted and functioning E-ZPass transponder passes through the lane where the latest transponder status file reflects a status of "valid" or "low balance" for such transponder and the Toll System's automatic vehicle classification data (see section 3.10 below) does not match the vehicle class data programmed onto the transponder.
TS-06 Requirement #3.3.6-2	Each Image Transaction record shall contain a copy of all of the transponder's on-board data (see section 3.6 below) when a transponder is properly mounted and functional.
TS-06 Requirement #3.3.6-3	Each Image Transaction record shall identify the transponder status file used to determine a transponder status and state the transponder's status (e.g. "lost/stolen").
TS-06 Requirement #3.3.6-4	Each Image Transaction record shall cross-reference to, and be indexed with, the Digital Video Audit video images (described in section 3.13 below).
TS-06 Requirement #3.3.6-5	Each Image Transaction record shall identify all violation image files (see section 3.12 below) specific to the respective vehicle's passage.
TS-06 Requirement #3.3.6-6	The lane controller shall cause the VDOT E-ZPass Customer Service Center to store and process the respective violation image files after transmitting such files as described in section 3.5.2 below.
TS-06 Requirement #3.3.6-7	The lane controller shall cause the Host Subsystem to only report Image Transactions after the corresponding electronic record transmission to the Host Subsystem and the image file transmission to the VDOT E-ZPass Customer Service Center are both successfully completed. When one but not both transmissions are complete, the Host Subsystem shall report such electronic records as incomplete transactions.

3.3.7. Other

Contract Criteria	
TS-06 Requirement #3.3.7-1	No form of electronic record other than the ACM Transaction, Manual ISF Transaction, ID Card Transaction, E-ZPass Transaction, Non-Revenue Transaction and Image Transaction forms (detailed above) are allowed.

3.4. Operating Modes

Contract Criteria	
TS-06 Requirement #3.4-1	The manual lane terminal (see section 3.9.1 below) shall provide for the mode of operation to be selectable for the respective traditional toll lane.
TS-06 Requirement #3.4-2	The Toll System shall provide a web browser interface for an Authority user(s) to make such selections from any workstation connected to the Authority's wide area network without special software or hardware.
TS-06 Requirement #3.4-3	Whenever the Authority's wide area network is experiencing degraded performance or is unavailable, the Toll System shall provide a web browser interface for an Authority user(s) to make such selections: - For any traditional lane at the Downtown Expressway mainline plaza from any such workstation attached to the Authority's local area network at the DTE plaza administration building - For any traditional lane at the Powhite Parkway mainline plazas from any such workstation attached to the Authority's local area network at the Powhite Parkway plaza administration building - For any traditional lane at the Boulevard Bridge from any such workstation attached to the Authority's local area network at the Boulevard Bridge administration building

Mode selection for the 11th Street ramps, 2nd Street ramps and Douglasdale ramps may rely on the Authority's wide area network.

The various modes of operation are further described below.

3.4.1. Maintenance Mode

Authority maintenance support staff will be assigned to the Authority user group with the Toll System privileges necessary to place a traditional lane in "Maintenance Mode".

Contract Criteria	
TS-06 Requirement #3.4.1-1	When the respective lane is operating in maintenance mode, the Traditional Lane Subsystem shall not transmit violation image files to the VDOT E-ZPass Customer Service Center and shall instead store them locally for thirty (30) days.

Contract Criteria	
TS-06 Requirement #3.4.1-2	The Toll System shall log and report each time a traditional lane is placed in Maintenance Mode and each time a traditional lane is taken out of Maintenance Mode.
TS-06 Requirement #3.4.1-3	When the respective lane is operating in maintenance mode, the Traditional Lane Subsystem shall cause the Host Subsystem to separately track and report all resulting transactions separately from revenue related transactions.
TS-06 Requirement #3.4.1-4	When the respective lane is operating in maintenance mode, the Traditional Lane Subsystem shall cause the Host Subsystem's MOMS function to log, store and send an alert at given intervals stating that this location is in maintenance mode, where the given interval shall be configurable by an Authority user(s).

3.4.2. Attended Mixed Mode

Attended Mixed Mode is restricted to those traditional lanes with Booth Equipment (see section 3.9 below)

Contract Criteria	
TS-06 Requirement #3.4.2-1	Where booth equipment is installed, the respective lane of the Traditional Lane Subsystem shall operate in Attended Mixed Mode with full performance when the automatic gate (see section 3.8.1 below) is: • Active, or • Configured to remain in the open position at all times.
TS-06 Requirement #3.4.2-2	Each electronic record (see section 3.3 above) produced by a traditional lane operating in Attended Mixed Mode shall identify the toll collection attendant logged in to the corresponding lane.
TS-06 Requirement #3.4.2-3	Each traditional lane operating in Attended Mixed Mode shall reliably process 800 vehicles per hour when the payment received for all said vehicles is in coin, the amount due is fully paid with no more than four coins and no receipts are issued. Each such lane shall provide this processing speed for an indefinite period under all conditions whenever one or more vaults of the automatic coin machine are not full.

3.4.3. Unattended Mixed Mode

Unattended Mixed Mode can be selected for any traditional lane with an Automatic Coin Machine (see section 3.7 below).

Contract Criteria	
TS-06 Requirement #3.4.3-1	Where an automatic gate is installed, the respective lane of the Traditional Lane Subsystem shall operate in Unattended Mixed Mode with full performance when the automatic gate (see section 3.8.1 below) is: • Active, or • Configured to remain in the open position at all times.

Contract Criteria	
TS-06 Requirement #3.4.3-2	Each electronic record (see section 3.3 above) produced by a traditional lane operating in Unattended Mixed Mode shall identify the toll collection attendant or plaza supervisor that last placed the corresponding lane in Unattended Mixed Mode.
TS-06 Requirement #3.4.3-3	Each traditional lane operating in Unattended Mixed Mode shall reliably process 900 vehicles per hour when the payment received for all said vehicles is in coin, the amount due is fully paid with no more than four coins and no receipts are issued. Each such lane shall provide this processing speed for an indefinite period under all conditions whenever both vaults of the automatic coin machine are not full.

3.4.4. "E-ZPass Only" Mode

"E-ZPass Only" Mode is restricted to those lanes equipped with violation image capture (see section 3.12 below).

Contract Criteria	
TS-06 Requirement #3.4.4-1	Where violation image capture (see section 3.12 below) is installed, each such lane of the Traditional Lane Subsystem shall operate in E-ZPass Only Mode with full performance when the automatic gate (see section 3.8.1 below) is: • Active, or • Configured to remain in the open position at all times.
TS-06 Requirement #3.4.4-2	Each electronic record (see section 3.3 above) produced by a traditional lane operating in "E-ZPass Only" Mode shall identify the toll collection attendant or plaza supervisor that last placed the corresponding lane in "E-ZPass Only" Mode.
TS-06 Requirement #3.4.4-3	Each traditional lane operating in E-ZPass Only Mode shall reliably process 1,200 vehicles per hour for an indefinite period where the automatic gate is active.
TS-06 Requirement #3.4.4-4	Each traditional lane operating in E-ZPass Only Mode shall reliably process 1,800 vehicles per hour for an indefinite period where the automatic gate is configured to remain in the open position at all times.

3.5. Network Communications

Contract Criteria	
TS-06 Requirement #3.5-1	The Contractor shall furnish and install all local area networks and all other communications between the Traditional Lane Subsystem elements in each toll lane.
TS-06 Requirement #3.5-2	The Contractor shall furnish and install all network communications between each lane controller (see section 3.2 above) at the Powhite Parkway northbound mainline plaza and all Authority workstations currently connected to the local area network serving that plaza.

Contract Criteria	
TS-06 Requirement #3.5-3	The Contractor shall furnish and install all network communications between each lane controller (see section 3.2 above) at the Powhite Parkway southbound mainline plaza and all Authority workstations currently connected to the local area network serving that plaza.
TS-06 Requirement #3.5-4	The Contractor shall furnish and install all network communications between each lane controller (see section 3.2 above) at the DTE mainline plaza and all Authority workstations currently connected to the local area network serving that plaza.
TS-06 Requirement #3.5-5	The Contractor shall furnish and install all network communications between each lane controller (see section 3.2 above) at the Boulevard Bridge plaza and all Authority workstations currently connected to the local area network serving that plaza.
TS-06 Requirement #3.5-6	The Contractor shall furnish, install and test all hardware and software for said local area network and shall be responsible for the placement, installation, physical tuning and integration of this hardware and software into the Contractor's Toll System design.

Key Performance Indicators for network communications are detailed in Appendix A of the TS-02 document.

3.5.1. With Host Subsystem

	Proposal Criteria
The Offeror shall include in their proposal a summary of how their design minimizes the bandwidth required on the Authority's wide area network when distributing both incremental updates to, and full replacements of, the transponder status files to each lane controller.	

This summary shall include a sketch-level calculation of the bandwidth required to distribute full replacement transponder status files from the Host Subsystem location (at the Powhite Parkway administration building) through the wide area network demarcation points at each of the following locations to all of their respective traditional lanes:

- All three Forest Hill ramps
- The Downtown Expressway plaza
- The Boulevard Bridge plaza
- Both Douglasdale ramps
- Both 2nd Street ramps
- Both 11th Street ramps

Demarcation points for the Authority's wide area network at these locations are further described in Appendix A of the TS-03 document.

Contract Criteria	
TS-06 Requirement #3.5.1-1	The Contractor shall furnish and install all network communications between the Host Subsystem and each lane controller (see section 3.2 above) at the Powhite Parkway mainline plazas. The Authority's wide area network shall not be used for these connections.
TS-06 Requirement #3.5.1-2	The Contractor shall furnish and install all network communications between each lane controller at the Forest Hill ramps, the Douglasdale ramps, the 2nd Street ramps and the 11th Street ramps and each of their respective demarcation points on the Authority's wide area network described in Appendix A of the TS-03 document.
TS-06 Requirement #3.5.1-3	Each lane controller shall receive and store the three (3) most recent versions of vehicle class and associated toll rate information (for each method of payment) transmitted from the Host Subsystem. All said files shall be stored in their original format and their entirety.
TS-06 Requirement #3.5.1-4	Each lane controller shall also store a default version of vehicle class and associated toll rate information (for each method of payment) and provide for such rates to apply when an Authority user(s) determines the transmitted toll rates are corrupted or otherwise unuseable.
TS-06 Requirement #3.5.1-5	Each lane controller shall receive all transponder status file information from the Host Subsystem as specified in the TS-04 document.

Contract Criteria	
TS-06 Requirement #3.5.1-6	Each lane controller shall cause the Host Subsystem's MOMS function (see the TS-04 document) to log whenever a transponder status file is received, updated, replaced or activated on a lane controller.
TS-06 Requirement #3.5.1-7	Each lane controller shall cause the Host Subsystem's MOMS function to log, store and send an alert each time a transponder status file is not updated or replaced within a given time period, where such time period shall be configurable on the Toll System by the Authority.
TS-06 Requirement #3.5.1-8	Each lane controller shall cause the Host Subsystem's MOMS function to log, store and send an alert each time a transponder status file is received in un-useable form or a replacement file varies from the size of its predecessor by 3% or more.
TS-06 Requirement #3.5.1-9	This log shall include the update or replacement transponder status file's unique identifier; the time and date it was successfully received from the Host Subsystem; the first electronic record (see section 3.3 above) number, time and date where it was used to create an electronic record; the last electronic record number, time and date where it was used before being replaced; and the unique identifier of the update that replaced it.
TS-06 Requirement #3.5.1-10	In 100% of all cases, this lane controller function shall use a transponder status file for all related activities starting five (5) minutes or less after it is received from the Host Subsystem. Use of this transponder file shall continue until the next transponder status file is ready for use at this location.
TS-06 Requirement #3.5.1-11	The Traditional Lane Subsystem shall transmit all Powhite Parkway traditional lane electronic records directly to the Host Subsystem without using the Authority's wide area network or VDOT network.
TS-06 Requirement #3.5.1-12	The Traditional Lane Subsystem shall transmit all Downtown Expressway traditional lane electronic records to the Host Subsystem via the Authority's wide area network demarcation point at the Downtown Expressway plaza building.
TS-06 Requirement #3.5.1-13	This lane controller function shall complete and successfully forward 100% of all Transactions (as described in sections 3.3 above) to the Host Subsystem within two (2) hours of the subject vehicle travelling through the traditional lane and log such transmission. Note that all E-ZPass Transaction records and all Image Transaction records (see sections 3.3.4 and 3.3.6 above) need to arrive at the VDOT E ZPass Customer Service Center as described in the TS-03 document and the KPIs.
TS-06 Requirement #3.5.1-14	The Traditional Lane Subsystem shall cause the Host Subsystem to log and report when each Transaction was successfully transmitted to the Host Subsystem.
TS-06 Requirement #3.5.1-15	The Traditional Lane Subsystem shall cause the Host Subsystem MOM's function (see the TS-04 document) to log, store and send an alert each time such Transaction is not sent within a given time period, where such time period shall be configurable on the Toll System by the Authority.

Contract Criteria	
TS-06 Requirement #3.5.1-16	All communications between the Traditional Lane Subsystem and the Host Subsystem shall be stored in a manner that makes it easy for an Authority user(s) to search for a data communication or period of communications, locate the communication(s) in the log, display that part of the log, make a copy of that part of the log in .pdf file format and email it as a .pdf file from any workstation connected to the Authority's wide area network without special software or hardware.

Requirements for guaranteed transmission protocols are further detailed in the TS-04 document.

3.5.2. With VDOT E-ZPass CSC

Proposal Criteria
The Offeror shall include in their proposal a sketch-level calculation of the file size(s) for all violation image files associated with an Image Transaction (see 3.3.6 above).

Contract Criteria	
TS-06 Requirement #3.5.2-1	The Contractor shall furnish and install all network communications between the lane controller for lane #4, #8 and #9 (at the Powhite Parkway northbound plaza) and the VDOT E-ZPass Customer Service Center network demarcation point at the same plaza. The Authority's wide area network shall not be used for these connections.
TS-06 Requirement #3.5.2-2	The Contractor shall furnish and install all network communications: • Between the lane controllers for lanes #33 and #34 (at the Boulevard Bridge plaza) and the demarcation point for the Authority's wide area network at the Boulevard Bridge plaza, and • Between the network demarcation point for the Authority's wide area network at the DTE plaza and the network demarcation point for the VDOT E-ZPass Customer Service Center network at the same plaza.
TS-06 Requirement #3.5.2-3	The Contractor shall furnish and install all network communications between the lane controller for lanes #50, #51, #52 and #53 (at the DTE Plaza) and the VDOT E-ZPass Customer Service Center network demarcation point at the same plaza. The Authority's wide area network shall not be used for these connections.
TS-06 Requirement #3.5.2-4	For all Image Transactions, the Traditional Lane Subsystem shall successfully transmit 100% of all image files (described in section 3.12 below) to the VDOT E-ZPass Customer Service Center within four (4) hours of when the subject vehicle travelled through the traditional lane and such transmission shall comply with Appendix B-1 of the TS-04 document.
TS-06 Requirement #3.5.2-5	The Traditional Lane Subsystem shall transmit all such Powhite Parkway traditional lane images directly to the VDOT E-ZPass Customer Service Center via the VDOT network demarcation point at the Powhite Parkway plaza building.

Contract Criteria	
TS-06 Requirement #3.5.2-6	The Traditional Lane Subsystem shall transmit all such Downtown Expressway traditional lane images directly to the VDOT E-ZPass Customer Service Center via the VDOT network demarcation point at the Downtown Expressway plaza building.
TS-06 Requirement #3.5.2-7	All such image transmissions shall comply with the VDOT E-ZPass Customer Service Center interface specifications in the appendixes of the TS-04 document.
TS-06 Requirement #3.5.2-8	The Traditional Lane Subsystem shall complete and forward 100% of all violation images (as full sets, described in section 3.15 below) to the VDOT E-ZPass Customer Service Center within four (4) hours of the subject vehicle travelling through the traditional lane and log such transmission.
TS-06 Requirement #3.5.2-9	The Traditional Lane Subsystem shall cause the Host Subsystem to log and report when each full set of violation images was successfully transmitted to the VDOT E-ZPass Customer Service Center.
TS-06 Requirement #3.5.2-10	The Traditional Lane Subsystem shall cause the Host Subsystem MOM's function to log, store and send an alert each time a full set of violation images is not sent within four (4) hours of the subject vehicle travelling through the traditional lane.
TS-06 Requirement #3.5.2-11	All communications between the Traditional Lane Subsystem and the VDOT E-ZPass Customer Service Center shall be stored in a manner that makes it easy for an Authority user(s) to search for a data communication or period of communications, locate the communication(s) in the log, display that part of the log, make a copy of that part of the log in .pdf file format and email it as a .pdf file from any workstation connected to the Authority's wide area network without special software or hardware.

3.5.3. With Authority Workstations

The Traditional Lane Subsystem communicates directly with Authority workstations (for Digital Video Audit functions) as described in section 3.13 below.

Contract Criteria	
TS-06 Requirement #3.5.3-1	All communications between the Traditional Lane Subsystem and Authority workstations shall be stored in a manner that makes it easy for an Authority user(s) to search for a data communication or period of communications, locate the communication(s) in the log, display that part of the log, make a copy of that part of the log in .pdf file format and email it as a .pdf file from any workstation connected to the Authority's wide area network without special software or hardware.

3.6. Automatic Vehicle Identification (AVI)

The Contractor may re-use the AVI readers, antennae, cabling and conduit currently installed in all traditional lanes and such re-use is encouraged.

Contract Criteria	
TS-06 Requirement #3.6-1	Where the Contractor chooses not to re-use one or more existing AVI readers, the Contractor shall: • Furnish and install Kapsch JANUS MPR2 (IAG protocol) AVI reader backplanes; Kapsch IAG-3 lane kits; LMR-600 antenna cabling; and all other reader cabling, and • Design, furnish and install all cabling, conduit and other items to synchronize such new readers with any other AVI reader having an antenna within 600' of any antenna connected to the new reader.
TS-06 Requirement #3.6-2	Where the Contractor chooses to re-use any existing AVI reader, the Contractor shall synchronize each new AVI reader provided by the Contractor (e.g. the new readers at the ORT zones) with any and all other AVI readers connected to an antenna located within 600' of any antenna connected to the new AVI reader.
TS-06 Requirement #3.6-3	The Contractor shall achieve and maintain all AVI reader synchronization throughout the Toll System installation sequence and do so without perturbing the antenna cabling, "firing sequence" or OEM tuning of any existing AVI readers that remain.
TS-06 Requirement #3.6-4	The Contractor shall tune and certify that all AVI readers, whether re-used or new, operate in accordance with E-ZPass Group performance requirements in each traditional lane.
TS-06 Requirement #3.6-5	The Traditional Lane Subsystem shall read the E-ZPass AVI transponder of each and every vehicle travelling through a traditional lane when such vehicle is equipped with a functional and properly mounted transponder.
TS-06 Requirement #3.6-6	The Traditional Lane Subsystem shall accurately read and maintain a record of all transponders where more than one E-ZPass transponder is present in a vehicle and associate this information with only the correct electronic record (see section 3.3 above).
TS-06 Requirement #3.6-7	This AVI function shall accurately read and maintain a record of any interoperable but non-E-ZPass transponder(s) present in a vehicle and associate this information with only the correct electronic record.
TS-06 Requirement #3.6-8	The Traditional Lane Subsystem shall buffer transponder reads in the E-ZPass AVI reader assembly when communications with the respective lane controller is unavailable and transmit those reads to such lane controller when communications are restored.
TS-06 Requirement #3.6-9	The Traditional Lane Subsystem shall write the traditional lane and plaza identifier and the time and date of passage onto 99.9 percent (99.9%) of all such transponders.
TS-06 Requirement #3.6-10	The Traditional Lane Subsystem shall accurately write to all such transponders where more than one E-ZPass transponder is present in a vehicle.

Contract Criteria	
TS-06 Requirement #3.6-11	Each Traditional Lane Subsystem location shall be tuned such that the transponders of vehicles that are not travelling in the respective lane are not reported by such lane's AVI function.
TS-06 Requirement #3.6-12	Each Traditional Lane Subsystem location shall be tuned such that false reads (e.g. cross lane reads) are less than 0.001 percent (0.001%) of all transactions in all cases.
TS-06 Requirement #3.6-13	Each Traditional Lane Subsystem location shall be tuned such that the transponders of vehicles that are not travelling in the respective lane are not written to by such lane's AVI function.
TS-06 Requirement #3.6-14	The Traditional Lane Subsystem shall reliably perform such transponder reads and writes for all vehicles including but not limited to motorcycles, motorcycle/car hybrids, cars, vans, buses, straight trucks and tractor-trailers.
TS-06 Requirement #3.6-15	The Traditional Lane Subsystem shall reliably perform such transponder reads and writes for all such vehicles travelling at very low speed (i.e. "stop and go" traffic conditions), all such vehicles travelling at 60 miles per hour and all such vehicles travelling at any speed in between.
TS-06 Requirement #3.6-16	The Traditional Lane Subsystem shall reliably perform such transponder reads and writes for all such E-ZPass transponders mounted in accordance with the transponder manufacturer's recommendations including but not limited to those mounted: a) To the interior of the windshield, or b) At the top of the vehicle's front license plate, or c) To the vehicle's roof, on the centerline and a minimum of three inches (3") from the front edge of the roof.
TS-06 Requirement #3.6-17	This AVI function shall meet all of the technical and operational requirements of the E-ZPass Group that are in effect on March 1, 2017 and be in accordance with the written recommendation of the original equipment manufacturer specific to each of the traditional lanes listed in section 2 above.
TS-06 Requirement #3.6-18	The Contractor shall use the same reader makes and models in Factory Acceptance Test activities as those that will be installed for the corresponding lane types in the field. No other backplane or lane kit elements are permitted.
TS-06 Requirement #3.6-19	The Contractor shall tune and certify that all AVI equipment used for Factory Acceptance Test is operating in accordance with E-ZPass Group performance requirements prior to all testing activities.

Existing AVI readers serving the traditional lanes consist of both Kapsch Roadcheck and Kapsch Badger models. Existing AVI antennas serving the traditional lanes are detailed in Appendix A of this TS-06 document.

The Authority will issue a letter allowing the Contractor to purchase E-ZPass Group compliant backplane elements, lane kit elements and related services from the original equipment manufacturer (i.e. Kapsch).

3.7. Automatic Coin Machine (ACM)

	Proposal Criteria
The Offeror shall include in their proposal a summary of no more than three (3) page-sides, detailing their proposed automatic coin machines for both the tunnel vault and self-contained configurations described below. Marketing material (e.g. catalog pages, brochures, etc.), service manuals and other information may be additionally provided in the form of an attachment(s) and this additional information will not count toward the page limit.	
The Offeror shall detail the proposed ACM and describe its: - Accuracy, reliability and counting speed - Security and tamper proof mechanisms for vaults both in and out of the ACM housing - Mechanisms for automatically and remotely switching the coin flow to each vault - Sensors, mechanisms and other automation to track and identify vaults - Sensors, mechanisms and other automation to track and identify the person performing vault insertions and removals	
The Offeror shall provide manufacturer catalog sheets for; detail the coin counting speed measurement methodology for; and attest that these units fully support the lane throughput requirements described in section 3.4 above.	
The Offeror shall identify where the same make, model and feature set of automatic coin machine is used by a toll agency in revenue operation and provide contact information for the agency staff member most familiar with the performance of the machines.	

Contract Criteria	
TS-06 Requirement #3.7-1	The Contractor shall furnish and install an automatic coin machine at each traditional lane identified in Appendix A of this TS-06 document (41 units in total, in the various configurations detailed in sections 3.7.1 and 3.7.2 below).
TS-06 Requirement #3.7-2	Each such automatic coin machine (ACM) shall be a Commercial Off The Shelf product and have the same model number and manufacturer.
TS-06 Requirement #3.7-3	Each ACM shall provide full performance under all the general environmental requirements for hardware (see the TS-03 document) and such performance levels shall not assume protection from a canopy or similar form of overhead protection, whether provided by the Contractor or provided by others.
TS-06 Requirement #3.7-4	The Contractor shall only use the open protocol interface of these units as installed and documented by their original manufacturer to integrate these units with their respective lane controllers (see section 3.2 above).
TS-06 Requirement #3.7-5	Each ACM shall be installed such that it is easy to operate from the driver seat of typical passenger cars, light vans and pick-up trucks in the associated lane and it operation will be obvious to practically all users.
TS-06 Requirement #3.7-6	Each ACM shall provide graphical instructions on its enclosure which are clear and easy to follow from the driver seat of typical passenger cars, light vans and pick-up trucks in the associated lane.

Contract Criteria	
TS-06 Requirement #3.7-7	Each ACM shall be serviced from the lane where it collects money and not require closure of the adjacent lane to keep personnel safe during Toll System maintenance, vault insertion and vault removal activities.
TS-06 Requirement #3.7-8	Each ACM shall be securely mounted on a frame and removable without toll island or toll booth demolition.
TS-06 Requirement #3.7-9	Each ACM shall include a configurable, variable message display that currently provides the following information to the motorist: • The correct toll to be paid, and • A decremented balance due as coins are inserted until the balance is zero The Contractor shall develop message details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.7-10	Such variable message display shall be easy to read from the driver seat of typical passenger cars, light vans and pick-up trucks in the associated lane and automatically adjust to ambient light conditions to optimize legibility.
TS-06 Requirement #3.7-11	Each ACM shall accurately process the following coins at the performance levels specified below: • U.S. $0.01 (penny), dated 1965 – present • U.S. $0.05 (nickel), dated 1965- present • U.S. $0.10 (dime), dated 1965 – present • U.S. $0.25 (quarter), dated 1965 – present • U.S. $0.50 (half dollar), dated 1965 – present • U.S. $1.00 (dollar), dated 1978 – present
TS-06 Requirement #3.7-12	Each ACM shall count coin payments with an accuracy of 99.9% or better under all conditions.
TS-06 Requirement #3.7-13	Each ACM shall fully support the lane throughput requirements described in section 3.4 above.
TS-06 Requirement #3.7-14	Each ACM shall reject and automatically recover from all instances of patrons depositing the following items into the automatic coin machine: • Bent coins • Coins issued by a national government other than those described above • Counterfeit coins and similarly shaped foreign objects • Foreign objects smaller than the largest coin listed above
TS-06 Requirement #3.7-15	The Toll System shall detect and log conditions in each ACM including but not limited to coin jams and other malfunctions.

Contract Criteria	
TS-06 Requirement #3.7-16	Each ACM shall store its coin intake in vaults (see section 3.7.3 below).
TS-06 Requirement #3.7-17	All such vaults shall be compatible with both the tunnel vault housing configuration and the stand-alone (i.e. on-board vault housing) configuration described in sections 3.7.1 and 3.7.2 below.
TS-06 Requirement #3.7-18	Each such ACM shall detect and report the vault to which coin intake is currently directed (i.e. the active vault).
TS-06 Requirement #3.7-19	The Toll System shall detect and log vault housing conditions including vault housings with missing vaults, the estimated time until the active vault in such housing is full, vault full and other vault switching conditions. The Contractor shall develop these details, and document all related design prior to the Midpoint Design Review Milestone, subject to the Authority's approval.
TS-06 Requirement #3.7-20	The Toll System shall automatically switch active vaults based on vault history, status and time of day in each ACM. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.7-21	The Toll System shall automatically switch active vaults at midnight at the end of each month.
TS-06 Requirement #3.7-22	The Toll System shall automatically select the active vault in the respective ACM each time a vault is inserted. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.7-23	The Toll System shall provide a web browser interface for an Authority user(s) to manually switch vaults in any ACM from any Authority workstation connected to the Authority's wide area network without special hardware or software.
TS-06 Requirement #3.7-24	For lanes with a toll booth, each such ACM (25 units in total) shall have a "mounting blister" and all other hardware for mounting the ACM securely and attractively through the toll booth wall. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.7-25	For lanes without a toll booth, each such ACM (18 units in total) shall have all hardware for mounting the ACM securely and attractively onto the toll island as a stand-alone unit.

3.7.1. Tunnel Vault Configuration

Contract Criteria	
TS-06 Requirement #3.7.1-1	The Contractor shall furnish and install a tunnel vault form of ACM at each Downtown Expressway and Powhite Parkway mainline plaza traditional lane identified in Appendix A (21 lanes of this type in total) of this TS-06 document.
TS-06 Requirement #3.7.1-2	Each such ACM shall have a vault housing located in the personnel tunnel under the plaza and: • Securely hold up to four vaults (see section 3.7.3 below) simultaneously within the housing • Provide key lock(s) to secure each such vault within the housing • Automated recording and logging of all vault insertions and removals by vault number and vault location • Automated recording and logging of the person performing each such vault insertion and removal • Automated recording and logging of each vault select and deselect, whether automated or manual
TS-06 Requirement #3.7.1-3	The vaults of each such ACM shall be interchangeable with all other vaults provided by the Contractor.
TS-06 Requirement #3.7.1-4	Each such ACM shall have a mechanism for automatically and remotely switching coin intake to each of the four vaults in this vault housing.
TS-06 Requirement #3.7.1-5	Each such ACM shall detect and report the vault to which such coin intake is currently directed (i.e. the active vault).
TS-06 Requirement #3.7.1-6	Each such ACM shall have all coin tube connections between the ACM elements installed at the roadway level (i.e. in the booth and/or on the island) with its four vaults in the personnel tunnel.
TS-06 Requirement #3.7.1-7	Each such ACM shall, without requiring any manual changes in system configuration parameters or settings, be fully interchangeable with all others provided by the Contractor in the tunnel vault configuration.

3.7.2. Self-Contained Configuration

Contract Criteria	
TS-06 Requirement #3.7.2-1	The Contractor shall furnish and install a self-contained form of ACM at each Boulevard Bridge, Douglasdale ramp, Forest Hill ramp, 2nd Street ramp and 11th Street ramp traditional lane identified in Appendix A (20 lanes of this type in total) of this TS-06 document.

Contract Criteria	
TS-06 Requirement #3.7.2-2	Each such ACM shall have a vault housing co-located with its coin counting elements and: • Hold up to two vaults (see section 3.7.3 below) simultaneously • Provide key lock(s) to secure each such vault within the housing • Automated recording and logging of all vault insertions and removals by vault number and vault location • Automated recording and logging of each vault select and deselect, whether automated or manual • Automated recording and logging of the person performing each such vault insertion and removal
TS-06 Requirement #3.7.2-3	The vaults of each such ACM shall be interchangeable with all other vaults provided by the Contractor.
TS-06 Requirement #3.7.2-4	Each such ACM shall have a mechanism for automatically and remotely switching the coin intake to each of the two vaults in this vault housing,
TS-06 Requirement #3.7.2-5	Each such ACM shall detect and report the vault to which such coin intake is currently directed (i.e. the active vault).
TS-06 Requirement #3.7.2-6	All elements of this form of the ACM shall mount on or above the existing toll island surface.
TS-06 Requirement #3.7.2-7	Each such ACM shall, without requiring any manual changes in system configuration parameters or settings, be fully interchangeable with all others provided by the Contractor in the self-contained configuration.

3.7.3. Vaults

Contract Criteria	
TS-06 Requirement #3.7.3-1	The Contractor shall furnish and install 400 vaults, each fully compatible with both the tunnel vault housing configuration and the stand-alone (i.e. on-board vault housing) configuration described in sections 3.7.1 and 3.7.2 above.
TS-06 Requirement #3.7.3-2	Each such vault shall be tamper proof, such that it is only unlocked when properly mounted in an ACM's vault housing or when the key remains inserted in its lock.
TS-06 Requirement #3.7.3-3	Each such vault shall include a unique permanent visual identifier and other identification as necessary for any ACM to automatically recognize and report, by vault identifier, each vault inserted or removed.

Contract Criteria	
TS-06 Requirement #3.7.3-4	The Toll System shall provide a web browser interface for an Authority user(s) to set up and revise schedules for creating vault manifests from any Authority workstation connected to the Authority's wide area network without special hardware or software.
TS-06 Requirement #3.7.3-5	The Toll System shall provide a web browser interface for an Authority user(s) to manually select vaults for addition to the vault manifest, select vaults for removal from the vault manifest, update vault status, record related events and print manifests from any Authority workstation connected to the Authority's wide area network without special hardware or software.
TS-06 Requirement #3.7.3-6	The Toll System shall provide a web browser interface for an Authority user(s) to denote the vault pick-up status and details once each transferred vault is verified by the supervisor and the armored car company from any Authority workstation connected to the Authority's wide area network without special hardware or software.
TS-06 Requirement #3.7.3-7	The Toll System shall prevent removal of any active vault (i.e. the vault selected to receive coins) when the respective lane is in Attended Mixed Mode or Unattended Mixed Mode.
TS-06 Requirement #3.7.3-8	The Toll System shall provide for removal of all vaults only when the respective lane is in Maintenance Mode.
TS-06 Requirement #3.7.3-9	The Toll System shall provide a web browser interface for an Authority user(s) to view both a listing and a graphic depiction showing the identifier, status and condition of all vaults currently installed in ACMs from any Authority workstation connected to the Authority's wide area network without special hardware or software.
TS-06 Requirement #3.7.3-10	This same interface shall show: • The quantity and value of each coin type that should be in each vault • The actual value of coins contained in each vault • The specific toll collection attendant shifts/tours that should be in each vault • The specific ACM Transactions and (partial payment) Manual ISF Transactions that should be in each vault, by vehicle class • The nominal value of all such transactions if they were paid in full
TS-06 Requirement #3.7.3-11	This same interface shall show the identifier, status, condition and current custodian of all other vaults.
TS-06 Requirement #3.7.3-12	The Toll System shall log and store vault manifest information including but not limited to vault insert time/date, vault removal time/date and the ID card information of the employee(s) inserting, selecting, de-selecting and removing such vault.

Contract Criteria	
TS-06 Requirement #3.7.3-13	The Toll System shall create and automatically update a vault manifest for each plaza identifying which vaults need to be pulled and transferred to the armored car company.
TS-06 Requirement #3.7.3-14	The Toll System shall automatically alert the supervisor on duty when vaults are ready to be pulled. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.7.3-15	The Toll System shall log and store all ACM activities including but not limited to vault housing door open, vault insertion, vault active, vault inactive and vault removal.

3.8. Other Island Equipment

3.8.1. Automatic Gate

Proposal Criteria
The Offeror shall include in their proposal a summary of no more than one (1) page side, detailing their proposed automatic gate and associated sensors, mechanisms and other automation.
The Offeror shall detail the proposed automatic gate and describe its: • Operating speeds • Sensors, mechanisms and other automation for preventing vehicle impacts
The Offeror shall provide manufacturer catalog sheets and attest that these units fully support the lane throughput requirements described in section 3.4 above.
The Offeror shall identify where the same make, model and feature set of automatic gate is used by a toll agency in revenue operation and provide contact information for the agency staff member most familiar with their performance.

Contract Criteria	
TS-06 Requirement #3.8.1-1	The Contractor shall furnish and install automatic gates in each traditional lane identified in Appendix A of this TS-06 document (40 units in total).
TS-06 Requirement #3.8.1-2	All automatic gates shall be Commercial Off The Shelf products and have the same model number, feature set and manufacturer.
TS-06 Requirement #3.8.1-3	The Contractor shall only use the open protocol interface of these units as installed and documented by their original manufacturer to integrate these units with their respective lane controllers (see section 3.2 above).

Contract Criteria	
TS-06 Requirement #3.8.1-4	Each automatic gate shall, without requiring any manual changes in system configuration parameters or settings, be fully interchangeable with all others provided by the Contractor.
TS-06 Requirement #3.8.1-5	Each automatic gate shall operate in active duty at all times except where an Authority user has specifically configured the Toll System otherwise.
TS-06 Requirement #3.8.1-6	Each automatic gate in active duty shall effectively deter vehicle travel, prevent gate impacts with vehicles and fully support all lane throughput requirements described in section 3.4 above.
TS-06 Requirement #3.8.1-7	The Toll System shall provide for each automatic gate in active duty to lift without manual intervention or additional activity on the manual lane terminal (see section 3.9.1 below) when the transaction in a lane is completed.
TS-06 Requirement #3.8.1-8	In Attended Mode, the manual lane terminal shall provide for the respective toll collection attendant to easily access and change a setting that causes the respective lane's automatic gate to operate in active duty or remain open at all times.
TS-06 Requirement #3.8.1-9	In Attended Mode, the manual lane terminal shall provide for the respective toll collection attendant to remotely raise the automatic gate of any other lane being operated in Unattended Mode or E-ZPass Mode for a specific vehicle sitting there. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.8.1-10	The Toll System shall provide a web browser interface for an Authority user(s), from any workstation connected to the Authority's wide area network without special software or hardware, to easily access and change a setting that causes all automatic gates within a plaza to operate in active duty or remain open at all times.
TS-06 Requirement #3.8.1-11	The Toll System shall log and report when any automatic gate is in active duty, when it is configured to remain open at all times and the Authority employee responsible for each such change.

3.8.2. Traffic Signal (Island Mounted)

	Proposal Criteria
The Offeror shall include in their proposal a summary of no more than one (1) page side, detailing their proposed island traffic signal and associated sensors and other automation.	
The Offeror shall provide manufacturer catalog sheets and attest that these units fully support the lane throughput requirements described in section 3.4 above.	

Contract Criteria	
TS-06 Requirement #3.8.2-1	The Contractor shall furnish and install island traffic signals in each traditional lane identified in Appendix A of this TS-06 document (48 units in total).
TS-06 Requirement #3.8.2-2	All island traffic signals shall be Commercial Off The Shelf products and have the same model number, feature set and manufacturer.
TS-06 Requirement #3.8.2-3	The Contractor shall only use the open protocol interface of these units as installed and documented by their original manufacturer to integrate these units with their respective lane controllers (see section 3.2 above).
TS-06 Requirement #3.8.2-4	Each island traffic signal shall, without requiring any manual changes in system configuration parameters or settings, be fully interchangeable with all others provided by the Contractor.
TS-06 Requirement #3.8.2-5	Each island traffic signal shall have: • One (1) red LED-type illuminated 8" diameter head • One (1) yellow LED-type illuminated 8" diameter head with "Low Bal" appearing on the illuminated face • One (1) green LED-type illuminated 8" diameter head • A top mounted yellow flashing violation beacon with an amplified violation horn • A mounting stanchion and all other hardware for toll island mounting The Contractor shall develop illumination timing details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.8.2-6	The Toll System shall provide for an Authority user(s) to individually adjust the volume of each amplified violation horn.
TS-06 Requirement #3.8.2-7	Each island traffic signal shall be easily seen from the driver seat of typical passenger cars, light vans and pick-up trucks in the associated lane and shall automatically adjust to ambient light conditions.

Contract Criteria	
TS-06 Requirement #3.8.2-8	The lights on such island traffic signal shall not distract motorists travelling in either direction and the Authority shall solely determine whether units meet this criterion where installed.
TS-06 Requirement #3.8.2-9	The lights on such island traffic signal shall not disturb nearby property owners and the Authority shall solely determine whether units meet this criterion where installed.

3.8.3. Signs (Island Mounted)

A patron fare display is provided with each automatic coin machine and fully integrated with the Toll System as described in section 3.7 above.

Other island mounted signs, where installed, are manually controlled and maintained by others. The Toll System shall operate independently of such signs.

3.9. Other Booth Equipment

Certain ACMs are booth mounted as described in section 3.7 above. The subsections below detail additional functions required at toll booth locations.

There is no requirement for the Traditional Lane Subsystem to perform any of the following operations via the booth equipment:

- Process motorist payments of Manual ISF Transactions
- Process ID card status changes or add, change or delete ID card user information
- Process motorist payments for toll violations
- Process motorist payments for E-ZPass transponder account replenishment

Proposal Criteria
The Offeror shall include in their proposal a summary of no more than one (1) page side, detailing their proposed manual lane terminals, receipt printers and magnetic stripe card readers.
The Offeror shall provide manufacturer catalog sheets and attest that these units fully support the lane throughput requirements described in section 3.4 above.

3.9.1. Manual Lane Terminal

Contract Criteria	
TS-06 Requirement #3.9.1-1	The Contractor shall furnish and install a manual lane terminal in the toll booth of each traditional lane identified in Appendix A of this TS-06 document (22 units in total).
TS-06 Requirement #3.9.1-2	All manual lane terminals shall be Commercial Off The Shelf touchscreen products and have the same model number, feature set and manufacturer.

Contract Criteria	
TS-06 Requirement #3.9.1-3	The Contractor shall only use the open protocol touch interface of these units as installed and documented by their original manufacturer to integrate these units with their respective lane controllers (see section 3.2 above).
TS-06 Requirement #3.9.1-4	Each manual lane terminal shall have an ergonomic mount by which the user can quickly and easily, without disassembly or use of tools, re-position the screen in three dimensions (up/down, left/right and forward/backward) and with roll, pitch and yaw anywhere in a range of + or – 90 degrees from a nominal setting determined by the Authority.
TS-06 Requirement #3.9.1-5	Each manual lane terminal shall, without requiring any manual changes in system configuration parameters or settings, be fully interchangeable with all others provided by the Contractor.
TS-06 Requirement #3.9.1-6	Each manual lane terminal shall have the following attributes: • 15" or larger viewing area (as measured diagonally) • Operates properly using a bare finger, gloved hand, stylus or similar device • Automatic control and manual over-ride for brightness • Easily read in any of the lighting conditions typically experienced in toll booths at the Authority's traditional lanes • Speaker(s), with easily accessible volume control, for audible feedback
TS-06 Requirement #3.9.1-7	Each manual lane terminal shall provide a simple, straightforward user interface that minimizes the number of button pushes required to process a transaction. Such minimization shall be approximate and shall take into account the frequency of each transaction type and its associated variations.
TS-06 Requirement #3.9.1-8	Such user interface shall present the vehicle class programmed into the E-ZPass transponder (if any) and provide for the toll collection attendant to rapidly re-classify the vehicle by entering a different axle count.
TS-06 Requirement #3.9.1-9	Such user interface shall provide for the toll collection attendant to rapidly "convert" an E-ZPass Transaction into an ID Card Transaction where the respective motorist presents a valid ID card.
TS-06 Requirement #3.9.1-10	Such user interface shall provide all tools and other functions for the toll collection attendant to process run-throughs (e.g. a vehicle that did not stop and would otherwise be subject to a Manual ISF Transaction).
TS-06 Requirement #3.9.1-11	Such user interface shall provide all tools and other functions for the toll collection attendant to process convoys paid by the first vehicle, paid by the last vehicle and paid by separate process. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.9.1-12	Such user interface shall provide all tools and other functions for the plaza supervisor to process a single payment due amount for special events (e.g. Fourth of July at the Boulevard Bridge).

Contract Criteria	
TS-06 Requirement #3.9.1-13	Such user interface shall provide all tools and other functions for the toll collection attendant to process numerous other unusual occurrences. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.9.1-14	Manual lane terminal entries shall occur when screen contact ends, allowing users to change their selection by dragging their finger (or alternative) to another button on the screen or an area of the screen where user input is not accepted.

3.9.2. Receipt Printer

Contract Criteria	
TS-06 Requirement #3.9.2-1	The Contractor shall furnish and install a receipt printer in the toll booth of each traditional lane identified in Appendix A of this TS-06 document (22 units in total).
TS-06 Requirement #3.9.2-2	All receipt printers shall be Commercial Off The Shelf products and have the same model number, feature set and manufacturer.
TS-06 Requirement #3.9.2-3	The Contractor shall only use the open protocol interface of these units as installed and documented by their original manufacturer to integrate these units with their respective lane controllers (see section 3.2 above).
TS-06 Requirement #3.9.2-4	Each receipt printer shall, without requiring any manual changes in system configuration parameters or settings, be fully interchangeable with all others provided by the Contractor.
TS-06 Requirement #3.9.2-5	Each receipt printer shall complete printing and issue a receipt within three (3) seconds of when the print is initiated from the manual lane terminal.
TS-06 Requirement #3.9.2-6	The Toll System shall provide for the toll collection attendant to determine and control (via the manual lane terminal) whether a receipt is printed or not printed on a transaction-by-transaction basis.
TS-06 Requirement #3.9.2-7	The Toll System shall complete a transaction whenever a toll collection attendant has requested a printed receipt and the receipt printer is not installed, is out of supplies (e.g. paper) or is unavailable due to failure or defect.
TS-06 Requirement #3.9.2-8	Receipts for previous transactions shall not automatically print when such receipt printer condition is resolved.
TS-06 Requirement #3.9.2-9	The Toll System shall process all subsequent transactions in the lane where such receipt printing was attempted without requiring the toll collection attendant to change the way they enter transactions on the manual lane terminal.

Contract Criteria	
TS-06 Requirement #3.9.2-10	Each receipt printer shall operate successfully using the same commonly available receipt paper, including operation in an environment where vehicle exhaust and dust are prevalent.
TS-06 Requirement #3.9.2-11	Each receipt printer shall provide for toll collection attendants to change the paper while continuing to process transactions and without the assistance of maintenance technicians or others.
TS-06 Requirement #3.9.2-12	Each receipt printer shall produce receipts and Manual ISF Transaction payment due notices. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.

3.9.3. Magnetic Stripe Card Reader

Contract Criteria	
TS-06 Requirement #3.9.3-1	The Contractor shall furnish and install a magnetic stripe card reader in the toll booth of each traditional lane identified in Appendix A of this TS-06 document (22 units in total).
TS-06 Requirement #3.9.3-2	All magnetic stripe card readers shall be Commercial Off The Shelf products and have the same model number, feature set and manufacturer.
TS-06 Requirement #3.9.3-3	The Contractor shall only use the open protocol interface of these units as installed and documented by their original manufacturer to integrate these units with their respective lane controllers (see section 3.2 above).
TS-06 Requirement #3.9.3-4	Each magnetic stripe card reader shall, without requiring any manual changes in system configuration parameters or settings, be fully interchangeable with all others provided by the Contractor.
TS-06 Requirement #3.9.3-5	Each magnetic stripe card reader shall be mounted with the manual lane terminal (see section 3.9.1 above) in an integrated manner.
TS-06 Requirement #3.9.3-6	Each magnetic stripe card reader, without requiring any manual changes in system configuration parameters or settings, shall be fully interchangeable with all others provided by the Contractor.
TS-06 Requirement #3.9.3-7	Each magnetic stripe card reader shall operate successfully using the Authority's existing magnetic stripe cards and all similarly configured cards, including operation in an environment where vehicle exhaust and dust are prevalent.
TS-06 Requirement #3.9.3-8	Each magnetic stripe card reader shall provide an efficient mechanism for a toll collection attendant to log into the Toll System.

Contract Criteria	
TS-06 Requirement #3.9.3-9	Each magnetic stripe card reader shall provide an efficient mechanism for a toll collection attendant to process ID Card Transactions (see section 3.3.3 above).

3.10. Automatic Vehicle Classification (AVC)

Vehicle class is based solely on the number of axles with tires touching the pavement. A copy of the Authority's toll rate schedule is provided in Appendix C of the TS-04 document showing the vehicle classes and the toll amounts currently charged for each.

Proposal Criteria
The Offeror shall include in their proposal a summary of no more than two (2) page-sides, detailing their proposed traditional lane vehicle classification solution.

Contract Criteria	
TS-06 Requirement #3.10-1	The Contractor shall furnish and install automatic vehicle classification in each traditional lane identified in Appendix A of this TS-06 document (12 lanes in total).
TS-06 Requirement #3.10-2	All AVC elements not embedded in the pavement shall, without requiring any manual changes in system configuration parameters or settings, be fully interchangeable with all others provided by the Contractor.
TS-06 Requirement #3.10-3	This AVC function shall measure the number of axles with tires touching the pavement and determine the associated vehicle class and toll rate.
TS-06 Requirement #3.10-4	This AVC function shall associate the measured axle count and the corresponding vehicle class and toll rate with the correct electronic record (see section 3.3 above) and only the correct electronic record.
TS-06 Requirement #3.10-5	This AVC function shall classify all such vehicles including but not limited to motorcycles, motorcycle/car hybrids, cars, vans, buses, straight trucks and tractor-trailers.
TS-06 Requirement #3.10-6	This AVC function shall classify all such vehicles travelling at very low speed (i.e. "stop and go" traffic conditions), all such vehicle travelling at 60 miles per hour and all such vehicles travelling at any speed in between when there is at least three (3) feet of spacing to the other vehicles preceding or succeeding said vehicle through the lane.
TS-06 Requirement #3.10-7	This AVC function shall detect any vehicle towing a trailer(s) and treat the combination as a single vehicle.
TS-06 Requirement #3.10-8	This AVC function shall detect any vehicle towing another vehicle and treat the combination as a single vehicle.

Contract Criteria	
TS-06 Requirement #3.10-9	This AVC function shall detect any vehicle carrying another vehicle(s) and treat the combination as a single vehicle.
TS-06 Requirement #3.10-10	This AVC function shall detect any vehicle equipped with a snow plow, hitch mounted platform or hitch mounted bicycle carrier and treat the combination as a single vehicle.

The Traditional Lane Subsystem is not required to:
- Classify vehicles based on dual tire detection
- Classify vehicles based on vehicle shape
- Classify vehicles based on weight
- Measure vehicle speeds

3.11. Canopy Equipment

Certain AVI equipment described in section 3.6 above is canopy mounted. Cameras and camera lighting for violation image capture may be canopy mounted as described in section 3.12 below.

3.11.1. Traffic Signal (Canopy Mounted)

The canopy mounted traffic signals, where installed, are manually controlled and maintained by others.

Contract Criteria	
TS-06 Requirement #3.11.1-1	The existing canopy mounted traffic signals and all related controls shall remain in place and operational.
TS-06 Requirement #3.11.1-2	The Toll System shall operate independently of the existing canopy mounted traffic signals and not affect their operation, appearance or visibility.

3.11.2. Signs (Canopy Mounted)

The canopy mounted signs, where installed, are manually controlled and maintained by others. These signs shall remain in place and the Toll System shall operate independently of said signs.

Contract Criteria	
TS-06 Requirement #3.11.2-1	The existing canopy mounted signs and all related controls shall remain in place and operational.
TS-06 Requirement #3.11.2-2	The Toll System shall operate independently of the existing canopy mounted signs and not affect their operation, appearance or visibility.

3.12. Violation Image Capture

Proposal Criteria
The Offeror shall include in their proposal a summary of no more than two (2) page-sides, detailing their proposed image capture solution.
This summary shall describe all Toll System lighting elements related to the image capture function.
This summary shall describe the number of images per vehicle, image resolution, average file size, file type and format produced by the proposed image capture function.
This summary shall list the toll agencies and locations where the Offeror has installed similar lighting and image capture equipment. The Offeror shall describe any differences in that version or configuration from the cameras, lighting, triggering mechanism, level of redundancy, etc. proposed here.

Contract Criteria	
TS-06 Requirement #3.12-1	The Contractor shall furnish and install violation image capture function in each traditional lane identified in Appendix A of this TS-06 document (9 lanes in total).
TS-06 Requirement #3.12-2	This violation image capture function shall capture an electronic image of the rear license plate of each and every vehicle travelling through the respective lane regardless of travel path where each such license plate image shall: a) Be a color image, regardless of ambient lighting conditions b) Be in a digital image format that is widely used by consumers c) Show all full-height characters in the plate identifier (often referred to as the "plate number") field of the license plate with at least 10 pixels of resolution in the vertical direction d) Show the entire width of the license plate with at least 150 pixels of resolution in the horizontal direction e) Be fully suitable for manual review
TS-06 Requirement #3.12-3	This violation image capture function shall associate each such license plate image file with the correct electronic record (see section 3.3 above) and only the correct electronic record.
TS-06 Requirement #3.12-4	This violation image capture function shall capture an electronic (overview) image of the rear of the vehicle for each and every vehicle travelling through the respective lane regardless of travel path where each such overview image shall: a) Be a color image, regardless of ambient lighting conditions b) Be in a digital image format that is widely used by consumers
TS-06 Requirement #3.12-5	This violation image capture function shall associate each such overview image file with the correct electronic record (see section 3.3 above) and only the correct electronic record.

Contract Criteria	
TS-06 Requirement #3.12-6	This violation image capture function shall include but is not limited to the cameras, camera enclosures, camera enclosure climate control and equipment protection elements, camera lighting, camera triggering mechanism, light sensor and brightness adjustment and contrast adjustment mechanisms addressing each location's varying weather and ambient light conditions.
TS-06 Requirement #3.12-7	This violation image capture function shall provide all image capture functions above and meet all performance requirements during: a) Concurrent operation of police radios, citizen band radios, mobile phones and other radio systems allowed or licensed by the FCC b) Concurrent operation of current or future roadside lighting and other electrically powered items c) Failure of any single camera d) Failure of any single (camera) lighting field replaceable unit e) Failure of any single (camera) triggering mechanism field replaceable unit f) Failure of any single (camera) light sensor g) Failure of any other single field replaceable unit including but not limited to server hardware, network switch, uninterruptible power supply, cable, etc.
TS-06 Requirement #3.12-8	All elements of this violation image capture function shall be Commercial Off The Shelf products and have the same model number, feature set and manufacturer.
TS-06 Requirement #3.12-9	Each element of this violation image capture function shall, without requiring any manual changes in system configuration parameters or settings, be fully interchangeable with all others provided by the Contractor.
TS-06 Requirement #3.12-10	The Contractor shall only use the open protocol interface of these elements as installed and documented by their original manufacturer to integrate these units with their respective lane controllers (see section 3.2 above).

Such image files are retained by the Traditional Lane Subsystem (as described in section 3.15 below) and transmitted to the VDOT E-ZPass Customer Service Center only for Image Transactions (as described in section 3.5.2 above).

Key Performance Indicators for image quality are detailed in Appendix A of the TS-02 document.

3.12.1. Coverage Conditions

Contract Criteria	
TS-06 Requirement #3.12.1-1	The violation image capture function shall provide the functions detailed above for all vehicles travelling in the respective lane including but not limited to motorcycles, motorcycle/car hybrids, cars, vans, buses, straight trucks and tractor-trailers.

Contract Criteria	
TS-06 Requirement #3.12.1-2	The violation image capture function shall provide the functions detailed above for all such vehicles travelling at very low speed (i.e. "stop and go" traffic conditions), all such vehicle travelling at 60 miles per hour and all such vehicles travelling at any speed in between when there is at least three (3) feet of spacing to the other vehicles preceding or succeeding said vehicle through the lane.

3.12.2. Lighting

Contract Criteria	
TS-06 Requirement #3.12.2-1	The violation image capture function shall provide all lighting necessary to meet the specified levels of performance, regardless of ambient conditions at the time of installation or in the future.
TS-06 Requirement #3.12.2-2	The violation image capture function shall provide all image capture functions and meet all performance requirements during: a) Normal operation b) Excessive glare conditions c) Any other ambient lighting conditions d) Any weather conditions
TS-06 Requirement #3.12.2-3	The violation image capture function shall automatically adjust, with or without traffic, its cameras to accommodate all lighting and weather conditions to maintain adequate brightness and contrast settings.
TS-06 Requirement #3.12.2-4	The violation image capture function shall provide all lighting necessary to meet the specified levels of performance, regardless of ambient conditions at the time of installation or in the future.
TS-06 Requirement #3.12.2-5	Such lighting shall not distract motorists travelling in either direction and the Authority shall solely determine whether lighting meets this criterion.
TS-06 Requirement #3.12.2-6	Such lighting shall not disturb nearby property owners and the Authority shall solely determine whether lighting meets this criterion.

3.13.   Digital Video Audit

Contract Criteria	
TS-06 Requirement #3.13-1	The Contractor shall furnish and install Digital Video Audit function in each traditional lane identified in Appendix A of this TS-06 document (40 logical lanes in total).

Contract Criteria	
TS-06 Requirement #3.13-2	Such Digital Video Audit function shall include but is not limited to two (2) or more high resolution color cameras at each of the traditional lane locations specified in Appendix A of this TS-06 document, all associated camera triggering, ambient lighting measurement and supplemental lighting.
TS-06 Requirement #3.13-3	Such cameras shall be a stationary type and continuously record video images of each traditional lane from locations both upstream and downstream of each.
TS-06 Requirement #3.13-4	Such cameras shall provide video images of these views clearly at all levels of ambient light including but not limited to zero lux.
TS-06 Requirement #3.13-5	All video images shall include an overlay of data fully synchronized to display an image of each vehicle with the associated electronic record (see section 3.3 above), respective Toll System sensor data and all manual lane terminal actions where manual lane terminals are installed.
TS-06 Requirement #3.13-6	All elements of the Digital Video Audit function shall be mounted where they are resistant to vandalism and these locations may require a bucket truck for installation or service.
TS-06 Requirement #3.13-7	Multiple lanes may be shown in an image, provided each vehicle and the corresponding overlay information (described below) is clearly shown. The Contractor shall propose the mounting locations subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.13-8	All elements of the Digital Video Audit function shall be Commercial Off The Shelf products and have the same model number, feature set and manufacturer.
TS-06 Requirement #3.13-9	The Contractor shall only use the open protocol interface of these units as installed and documented by their original manufacturer to integrate these units with their respective lane controllers (see section 3.2 above).
TS-06 Requirement #3.13-10	Each Digital Video Audit element shall, without requiring any manual changes in system configuration parameters or settings, be fully interchangeable with all others provided by the Contractor.
TS-06 Requirement #3.13-11	The Toll System shall provide a web browser interface for an Authority user(s) to view both live and recorded views of each from any workstation connected to the Authority's wide area network without special software or hardware.
TS-06 Requirement #3.13-12	These video images and all other data of the Digital Video Audit function shall be read-only and the Toll System shall prevent changes and alterations.

Coverage area and vehicle type requirements for the Digital Video Audit function are the same as those specified for the violation image function in section 3.12.1 above.

Lighting requirements for the Digital Video Audit function are the same as those specified for violation image function in section 3.12.2 above.

3.14. MOMS

Contract Criteria	
TS-06 Requirement #3.14-1	The Traditional Lane Subsystem shall cause the Host Subsystem MOMS function to log, store and send an alert in the event the operating mode (see section 3.4 above) changes.
TS-06 Requirement #3.14-2	The Traditional Lane Subsystem shall cause the Host Subsystem MOMS function to log, store and send an alert in the event of any Traditional Lane Subsystem element failure or degradation in performance.
TS-06 Requirement #3.14-3	The Toll System shall provide a web browser interface for an Authority user(s) to set comprehensive threshold values for issuing alerts of performance degradation including but not limited to message queues and system process backlogs from any workstation connected to the Authority's wide area network without special software or hardware.

3.15. Capacity

Contract Criteria	
TS-06 Requirement #3.15-1	The Traditional Lane Subsystem at each traditional lane shall operate in a stand-alone mode for a minimum of thirty (30) days without manual intervention if the network connection to the Host Subsystem and/or VDOT E-ZPass Customer Service Center is unavailable.
TS-06 Requirement #3.15-2	The Traditional Lane Subsystem at each location shall operate indefinitely without the Authority's network when the manual data on-load and data off-load mechanism described in section 3.5.1 above is utilized.
TS-06 Requirement #3.15-3	Each lane controller shall store all electronic records (see section 3.3 above) for at least thirty (30) days.
TS-06 Requirement #3.15-4	Each lane controller shall have sufficient storage to store all violation image capture (see section 3.12 above) images for at least thirty (30) days including but not limited to any images generated by redundant cameras, multiple image triggers per vehicle or any combination thereof.
TS-06 Requirement #3.15-5	Each lane controller shall automatically erase each license plate image file after a specified retention period of no less than seven (7) days and no more than four hundred (400) days. The Toll System shall provide a web browser interface for an Authority user(s) to set and change this specific retention period from any workstation equipped with a common browser and connected to the Authority's wide area network without special hardware or software.

Contract Criteria	
TS-06 Requirement #3.15-6	The capacity requirements stated above shall apply to any given period starting at the time of installation and extending for twelve (12) years after Project Acceptance using the traffic projections provided in Appendix D of the TS-04 document.
TS-06 Requirement #3.15-6	When storage capacity reaches a configurable utilization percentage (for example 80%), the Traditional Lane Subsystem shall cause the Host Subsystem's MOMS function to log, store and issue an alert.

3.16. UPS

Contract Criteria	
TS-06 Requirement #3.16-1	The Contractor shall furnish and install an uninterruptible power supply (UPS) to power and protect each lane controller (see section 3.2 above) and all other Traditional Lane Subsystem equipment serving the same lane.
TS-06 Requirement #3.16-2	Each lane controller shall cause the Host Subsystem's MOMS function to log and issue an alert when a threshold of its respective UPS battery power has been reached.
TS-06 Requirement #3.16-3	Each lane controller shall cause the respective automatic coin machine (see section 3.7 above) to gracefully power down when a threshold of its respective UPS battery power has been reached.
TS-06 Requirement #3.16-4	Each lane controller shall cause the respective automatic gate (see section 3.8.1 above) to remain in the open position when the respective lane is depleting its UPS battery power. Alternatively, the Contractor may wire the automatic gates such that they are independent of the UPS batter power if a) suitable power conditioning is provided and b) the Contractor can demonstrate prior to the Midpoint Design Review milestone that brownouts and other degradation of utility or generator power will not cause the gate to impact vehicles or shorten the useful life of the gate..
TS-06 Requirement #3.16-5	Each lane controller shall gracefully resume operation of the automatic coin machine and automatic gate without manual intervention when external power to the UPS is restored. The Contractor shall develop details of resuming operation of the automatic coin machine and automatic gate subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.16-6	Each lane controller shall shut down all of its respective elements gracefully when a threshold of its respective UPS battery power has been reached.

Contract Criteria	
TS-06 Requirement #3.16-7	After such shutdown, each lane controller shall resume all operation without manual intervention when external power to the UPS is restored and: • Lanes operating in Attended Mixed Mode at the time of such graceful shutdown shall resume operation in Unattended Mixed Mode, and • All other lanes shall resume full function operation in the operating mode they were in immediately prior to such graceful shutdown. The Contractor shall develop these details subject to the Authority's approval and document all related design prior to the Midpoint Design Review Milestone.
TS-06 Requirement #3.16-8	The thresholds described above shall be independent of one another and the Toll System shall provide a web browser interface for an Authority user(s) to easily configure each from any workstation equipped with a common browser and connected to the Authority's wide area network without special hardware or software.

Additional UPS requirements are detailed in the TS-03 document.

4. SYSTEM DESIGN DOCUMENTATION

The Contractor shall evaluate the Authority's current operations, interaction with the current toll system and associated processes. The Contractor shall then document the associated Traditional Lane Subsystem business rules in the System Design Requirements document as described in the TS-01 document.

Contract Criteria	
TS-06 Requirement #4-1	The SDD document shall detail all hardware and software that implements the functions in section 3 above.
TS-06 Requirement #4-2	The SDD document shall detail all COTS hardware and COTS software in the Traditional Lane Subsystem, all status information specified by the manufacturer for each and how this information is monitored by the lane controller function.
TS-06 Requirement #4-3	The SDD document shall detail all fault tolerance designed into the Traditional Lane Subsystem and how function and performance are maintained in the event of any element failure or degradation in performance.
TS-06 Requirement #4-4	The SDD document shall detail how the Traditional Lane Subsystem causes the Host Subsystem's MOMS function to log, store and send an alert in the event of any element failure or degradation in performance.
TS-06 Requirement #4-5	The SDD document shall detail the transmission protocol(s) amongst and between all functions in section 3 above and how such communications are stored, searched, displayed, copied and e-mailed.
TS-06 Requirement #4-6	The SDD document shall detail lane controller function in those cases where a vehicle partially or fully enters the traditional lane and then partially or fully backs up through the traditional lane.

Contract Criteria	
TS-06 Requirement #4-7	The SDD document shall detail the hardware and software used to implement all other Traditional Lane Subsystem functions.
TS-06 Requirement #4-8	The SDD document shall include the electromagnetic profile for each Traditional Lane Subsystem location (as described in the TS-03 document).
TS-06 Requirement #4-9	The Midpoint Design Review Submittal of the SDD document shall detail all of the design items required prior to the Midpoint Design Review Milestone above.
TS-06 Requirement #4-10	The Test Plan and the Detailed Test Procedures documents shall both state that tuning and certification of the Automatic Vehicle Identification equipment (see section 3.6 above) shall be successfully completed immediately prior to the commencement of Factory Acceptance Test and prior to any Revenue Service Acceptance Test activities at any Traditional Lane Subsystem location.
TS-06 Requirement #4-11	The Detailed Test Procedures document shall state that tuning and certification of the Automatic Vehicle Identification equipment (see section 3.6 above) shall be successfully completed prior to the commencement of any Revenue Service Acceptance Test activities at any Traditional Lane Subsystem location.
TS-06 Requirement #4-12	The Detailed Test Procedures document (see the TS-01 document) shall fully describe the testing of the Traditional Lane Subsystem including but not limited to those specified in section 3 above.
TS-06 Requirement #4-13	The System Manuals (see the TS-01 document) shall fully describe all administration, supervision, use and maintenance functions of the Traditional Lane Subsystem including but not limited to those specified in section 3 above.
TS-06 Requirement #4-14	The Training Materials (see the TS-01 document) shall fully describe all administration, supervision, use and maintenance functions of the Traditional Lane Subsystem including but not limited to those specified in section 3 above.

Other SDD document and milestone requirements are detailed in the TS-01 document.

5. HARDWARE AND INSTALLATION

	Proposal Criteria
The Offeror shall include in their proposal a summary of no more than two (2) page-sides, detailing their proposed installation sequence in a single traditional lane.	

Contract Criteria	
TS-06 Requirement #5-1	Except as described in section 3.6 above, re-use of any existing toll system equipment is not allowed and the Contractor shall remove, scrap for zero value and dispose of all such elements including but not limited to toll system equipment mounted on the canopy, on the toll island, in the toll booth and in the personnel tunnel; cabling; exposed conduit; mounting hardware; and enclosures at each of the locations described in section 2 above.
TS-06 Requirement #5-2	The Contractor shall remove the pavement loops and sealant and replace the pavement where existing loops interfere with Contractor's design.
TS-06 Requirement #5-3	The Contractor shall remove treadle frames and replace the pavement where existing treadles interfere with Contractor's design.
TS-06 Requirement #5-4	The Contractor's installation sequence shall not rely on any assistance or accommodation from the parties maintaining the current toll system at the traditional lanes.
TS-06 Requirement #5-5	The Contractor shall provide all maintenance of traffic for all removal and installation work at the Traditional Lane Subsystem locations.

Additional requirements for hardware and installation are detailed in the TS-03 document.

6. INFRASTRUCTURE DOCUMENTATION

Contract Criteria	
TS-06 Requirement #6-1	The Detailed Design Drawings, Detailed Design Calculations, Detailed Design Specifications and Shop Drawings shall fully describe installation of all enclosures and the available spare capacity, cooling load and equipment operating temperatures at the specified ambient conditions in each.
TS-06 Requirement #6-2	The Detailed Design Drawings, Detailed Design Calculations, Detailed Design Specifications and Shop Drawings shall fully describe installation of all pavement mounted sensors and all associated cabling and conduit.
TS-06 Requirement #6-3	The Detailed Design Drawings, Detailed Design Calculations, Detailed Design Specifications and Shop Drawings shall fully describe installation of all Digital Video Audit elements including but not limited to cameras and lighting and all associated cabling and conduit.

Contract Criteria	
TS-06 Requirement #6-4	The Detailed Design Drawings, Detailed Design Calculations, Detailed Design Specifications and Shop Drawings shall fully describe installation of all other Toll System elements including but not limited to other equipment, conduit, mounting hardware and cabling.
TS-06 Requirement #6-5	The Detailed Design Drawings, Detailed Design Calculations, Detailed Design Specifications and Shop Drawings shall fully describe all lighting furnished by the Contractor and assess its suitability per the requirements specified in section 3.12.2 above.

Other requirements for the Engineer Of Record, infrastructure documentation and associated milestones are described in the TS-01 document.

TS-06: APPENDIX A

Disposition Of Existing Equipment And
Required Toll System Function (By Location)

TS-06 Appendix A
Required Functions: Traditional Lanes

Lane #	Location	Revers-ible	AVI (E-ZPass)	ACM		AVC	Violation Image Capture	Digital Video Audit	AG	ITS	MLT	RP	MSCR
				Mount Type	Vault Housing Type and Location								
1	Powhite Mainline SB		Yes	Booth Mounted	4 vault, In tunnel	Yes		Yes	Yes	Yes	Yes	Yes	Yes
2	Powhite Mainline SB		Yes	Booth Mounted	4 vault, In tunnel	Yes		Yes	Yes	Yes	Yes	Yes	Yes
3	Powhite Mainline SB		Yes	Booth Mounted	4 vault, In tunnel	Yes		Yes	Yes	Yes	Yes	Yes	Yes
4	Powhite Mainline SB		Yes	Standalone	4 vault, In tunnel			Yes	Yes	Yes			
5	Powhite Mainline SB		Yes	Standalone	4 vault, In tunnel			Yes	Yes	Yes			
6	Powhite Mainline SB		Yes	Standalone	4 vault, In tunnel			Yes	Yes	Yes			
7	Powhite Mainline SB		Yes	Standalone	4 vault, In tunnel		Yes	Yes	Yes	Yes			
8	Powhite Mainline NB		Yes				Yes	Yes	Yes	Yes			
9	Powhite Mainline NB		Yes	Standalone	4 vault, In tunnel		Yes	Yes	Yes	Yes			
10	Powhite Mainline NB		Yes	Standalone	4 vault, In tunnel			Yes	Yes	Yes			
11	Powhite Mainline NB		Yes	Standalone	4 vault, In tunnel			Yes	Yes	Yes			
12	Powhite Mainline NB		Yes	Booth Mounted	4 vault, In tunnel	Yes		Yes	Yes	Yes	Yes	Yes	Yes
13	Powhite Mainline NB		Yes	Booth Mounted	4 vault, In tunnel	Yes		Yes	Yes	Yes	Yes	Yes	Yes
14	Powhite Mainline NB		Yes	Booth Mounted	4 vault, In tunnel	Yes		Yes	Yes	Yes	Yes	Yes	Yes
43	DTE Mainline WB		Yes	Booth Mounted	4 vault, In tunnel	Yes		Yes	Yes	Yes	Yes	Yes	Yes
44	DTE Mainline WB		Yes	Booth Mounted	4 vault, In tunnel	Yes		Yes	Yes	Yes	Yes	Yes	Yes
45	DTE Mainline WB		Yes	Booth Mounted	4 vault, In tunnel	Yes		Yes	Yes	Yes	Yes	Yes	Yes
46	DTE Mainline WB		Yes	Standalone	4 vault, In tunnel			Yes	Yes	Yes			
50	DTE Mainline EB		Yes				Yes	Yes	Yes	Yes			
51	DTE Mainline EB		Yes				Yes	Yes	Yes	Yes			
52	DTE Mainline EB		Yes				Yes	Yes	Yes	Yes			
53	DTE Mainline EB		Yes				Yes	Yes	Yes	Yes			
54	DTE Mainline EB		Yes	Booth Mounted	4 vault, In tunnel			Yes	Yes	Yes			
55	DTE Mainline EB		Yes	Booth Mounted	4 vault, In tunnel	Yes		Yes	Yes	Yes	Yes	Yes	Yes
56	DTE Mainline EB		Yes	Booth Mounted	4 vault, In tunnel	Yes		Yes	Yes	Yes	Yes	Yes	Yes
57	DTE Mainline EB		Yes	Booth Mounted	4 vault, In tunnel	Yes		Yes	Yes	Yes	Yes	Yes	Yes

ACM = Automatic Coin Machine, AG = Automatic Gate, ITS = Island Traffic Signal, MLT = Manual Lane Terminal, RP = Receipt Printer, MSCR = Magnetic Stripe Card Reader

Lane #	Location	Revers-ible	AVI (E-ZPass)	ACM Mount Type	ACM Vault Housing Type and Location	AVC	Violation Image Capture	Digital Video Audit	AG	ITS	MLT	RP	MSCR
16	Forest Hill - Off ramp		Yes	Booth Mounted	2 vault, in booth			Yes	Yes	Yes	Yes	Yes	Yes
18	Forest Hill - Off ramp		Yes	Booth Mounted	2 vault, in booth			Yes	Yes	Yes	Yes	Yes	Yes
20	Forest Hill - Off ramp		Yes	Booth Mounted	2 vault, in booth			Yes	Yes	Yes			
22	Forest Hill - Off ramp		Yes	Standalone	2 vault, in booth			Yes	Yes	Yes			
15	Forest Hill - On ramp		Yes	Booth Mounted	2 vault, in booth			Yes	Yes	Yes	Yes	Yes	Yes
17	Forest Hill - On ramp		Yes	Booth Mounted	2 vault, in booth			Yes	Yes	Yes	Yes	Yes	Yes
19	Forest Hill - On ramp		Yes	Booth Mounted	2 vault, in booth			Yes	Yes	Yes	Yes	Yes	Yes
21	Forest Hill - On ramp		Yes	Booth Mounted	2 vault, in booth			Yes	Yes	Yes	Yes	Yes	Yes
31	Boulevard Bridge SB		Yes	Booth Mounted	2 vault, in booth			Yes *1	Yes	Yes	Yes	Yes	Yes
32	Boulevard Bridge SB		Yes	Booth Mounted	2 vault, in booth			Yes *1	Yes	Yes	Yes	Yes	Yes
33	Boulevard Bridge SB	Yes (PM)	Yes			Yes		Yes *1	Yes	Yes			
34	Boulevard Bridge NB	Yes (AM)	Yes			Yes		Yes *1	Yes	Yes			
35	Boulevard Bridge NB		Yes	Booth Mounted	2 vault, in booth			Yes *1	Yes	Yes	Yes	Yes	Yes
36	Boulevard Bridge NB		Yes	Booth Mounted	2 vault, in booth			Yes *1	Yes	Yes	Yes	Yes	Yes
23	Douglasdale - On ramp		Yes	Standalone	2 vault, on island					Yes			
25	Douglasdale - Off ramp		Yes	Standalone	2 vault, on island					Yes			
61	2nd Street EB - On ramp		Yes	Standalone	2 vault, on island					Yes			
62	2nd Street WB - Off ramp		Yes	Standalone	2 vault, on island					Yes			
71	11th Street EB - On ramp		Yes	Standalone	2 vault, on island					Yes			
72	11th Street EB - On ramp		Yes	Standalone	2 vault, on island					Yes			
73	11th Street WB - Off ramp		Yes	Standalone	2 vault, on island					Yes			
74	11th Street WB - Off ramp		Yes	Standalone	2 vault, on island					Yes			

*1 All Digital Video Audit function required except livestreaming

ACM = Automatic Coin Machine, AG = Automatic Gate, ITS = Island Traffic Signal, MLT = Manual Lane Terminal, RP = Receipt Printer, MSCR = Magnetic Stripe Card Reader

| Lane # | Location | AVI | | ACM | AVC | | | AG | ITS | MLT | RP | MSCR |
		E-ZPass Reader	E-ZPass Antenna	(coin counter, coin switcher, vault housing, coin tubes, etc.)	Entry Pavement Loop	Exit Pavement Loop	Treadle & Treadle Frame					
1	Powhite Mainline SB	Badger *1	IAG-2 *1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	Powhite Mainline SB	Badger *1	IAG-1 *1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	Powhite Mainline SB	Badger *1	IAG-1 *1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	Powhite Mainline SB	Badger *1	IAG-1 *1	Yes	Yes	Yes	-	Yes	Yes	-	-	-
5	Powhite Mainline SB	Badger *1	IAG-1 *1	Yes	Yes	Yes	-	Yes	Yes	-	-	-
6	Powhite Mainline SB	Badger *1	IAG-1 *1	Yes	Yes	Yes	-	Yes	Yes	-	-	-
7	Powhite Mainline SB	Badger *1	IAG-1 *1	Yes	Yes	Yes	-	Yes	Yes	-	-	-
8	Powhite Mainline NB	Badger *1	IAG-1 *1		Yes	Yes	-	Yes	Yes	-	-	-
9	Powhite Mainline NB	Badger *1	IAG-1 *1	Yes	Yes	Yes	-	Yes	Yes	-	-	-
10	Powhite Mainline NB	Badger *1	IAG-1 *1	Yes	Yes	Yes	-	Yes	Yes	-	-	-
11	Powhite Mainline NB	Badger *1	IAG-1 *1	Yes	Yes	Yes	-	Yes	Yes	-	-	-
12	Powhite Mainline NB	Badger *1	IAG-1 *1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
13	Powhite Mainline NB	Badger *1	IAG-1 *1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
14	Powhite Mainline NB	Badger *1	IAG-1 *1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
43	DTE Mainline WB	Badger *1	IAG-1 *1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	43
44	DTE Mainline WB	Badger *1	IAG-1 *1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
45	DTE Mainline WB	Badger *1	IAG-1 *1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
46	DTE Mainline WB	Badger *1	IAG-1 *1	Yes	Yes	Yes	-	Yes	Yes	-	-	-
50	DTE Mainline EB	Badger *1	IAG-1 *1	Yes	Yes	Yes	-	Yes	Yes	-	-	-
51	DTE Mainline EB	Badger *1	IAG-1 *1	Yes	Yes	Yes	-	Yes	Yes	-	-	-
52	DTE Mainline EB	Badger *1	IAG-1 *1	Yes	Yes	Yes	-	Yes	Yes	-	-	-
53	DTE Mainline EB	Badger *1	IAG-1 *1	Yes	Yes	Yes	-	Yes	Yes	-	-	-
54	DTE Mainline EB	Badger *1	IAG-1 *1	Yes	Yes	Yes	-	Yes	Yes	-	-	-
55	DTE Mainline EB	Badger *1	IAG-1 *1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
56	DTE Mainline EB	Badger *1	IAG-1 *1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
57	DTE Mainline EB	Badger *1	IAG-1 *1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*1 Removal not required if re-used per the Contract terms.

ACM = Automatic Coin Machine, AG = Automatic Gate, ITS = Island Traffic Signal, MLT = Manual Lane Terminal, RP = Receipt Printer, MSCR = Magnetic Stripe Card Reader

TS-06 Appendix A
Required Removals: Traditional Lanes

Lane #	Location	AVI E-ZPass Reader		E-ZPass Antenna		ACM (coin counter, coin switcher, vault housing, coin tubes, etc.)	AVC Entry Pavement Loop	Exit Pavement Loop	Treadle & Treadle Frame	AG	ITS	MLT	RP	MSCR
16	Forest Hill - Off ramp	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes
18	Forest Hill - Off ramp	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes
20	Forest Hill - Off ramp	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-	Yes	Yes	-	-	-
22	Forest Hill - Off ramp	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-	Yes	Yes	-	-	-
15	Forest Hill - On ramp	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes
17	Forest Hill - On ramp	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes
19	Forest Hill - On ramp	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes
21	Forest Hill - On ramp	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes
31	Boulevard Bridge SB	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes
32	Boulevard Bridge SB	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes
33	Boulevard Bridge SB	Roadcheck	*1	IAG-1	*1	-	Yes	Yes	-	Yes	Yes	-	-	-
34	Boulevard Bridge NB	Roadcheck	*1	IAG-1	*1	-	Yes	Yes	-	Yes	Yes	-	-	-
35	Boulevard Bridge NB	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes
36	Boulevard Bridge NB	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes
23	Douglasdale - On ramp	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-		Yes	-	-	-
25	Douglasdale - Off ramp	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-		Yes	-	-	-
61	2nd Street EB - On ramp	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-		Yes	-	-	-
62	2nd Street WB - Off ramp	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-		Yes	-	-	-
71	11th Street EB - On ramp	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-		Yes	-	-	-
72	11th Street WB - On ramp	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-		Yes	-	-	-
73	11th Street EB - Off ramp	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-		Yes	-	-	-
74	11th Street WB - Off ramp	Roadcheck	*1	IAG-1	*1	Yes	Yes	Yes	-		Yes	-	-	-

*1 Removal not required if re-used per the Contract terms.

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