Attachments

Attachment 1 – NCTA Business Policies

Attachment 2 - State of NC, Statewide Info. Security Manual

Attachment 3 – Preventative Maintenance Checklist

Attachment 4 – ITS, AET & RTCS As-Builts

Attachment 5 - Project Responsibility Matrix

Attachment 6 – Equipment Re-Use Matrix

Attachment 7 - OBO ICD

Attachment 8 - Lane Closure Restrictions

Attachment 9 - Future Transaction Projections

Attachment 10 - KPI Guidebook

Attachment 11 – Transition Impact Fees

Attachment 12 – Transition Requirements

Attachment 13 – Toll Location Photo Tour

Attachment 1
NCTA Business Policies

The following 2 documents are "paper clipped" to this Attachments file for ease of reference: 1) *NC Quick Pass Business Policies* 2) *NCTA Program Policies for Tolling System Operations*

Attachment 2

State of NC, Statewide Information Security Manual

The following document is "paper clipped" to this Attachments file for ease of reference: 1) *Attachment 2_NC Statewide Info. Security Manual*

Attachment 3
Preventative Maintenance Checklist

Preventative Maintenance Checklist

This maintenance schedule is provided as a general outline of the expectations of the Contractor's Scope of Work. The preventative maintenance schedule may include additional items to meet the proposed solutions requirements and manufacture's maintenance schedule.

All preventive maintenance activities shall be scheduled and tracked utilizing the IT Service Management (ITSM) provided as part of this Project. The ITSM will serve as the system of record for preventive maintenance related KPI's.

Roadside Toll Collection System (RTCS)

Daily Remote Check – A check of every toll zone for proper function of all elements and any outstanding alarms. Multiple transactions will be checked for all required elements from all travel lanes.

Weekly Onsite Check – An onsite visual check of the RSS from the maintenance area. General condition of the RSS equipment mounted on the gantry, on the cabinet pad and in the vicinity will be noted for any issues that need to be addressed.

Monthly Remote Check – An in-depth review of logs for zone controllers, servers, networking equipment, etc. to monitor performance and detect issues.

Semi Annual Check – An in-depth, full maintenance of the toll zone. With scheduled and approved lane closures, all aspects of the AVDC, ICPS, AVI, and DVAS will be inspected, cleaned, and tested for proper operation. RSS cabinets, HVACs, servers, will be checked for clear vents, fully functioning environmental systems as applicable and application of pest abatement, as needed.

FACILTIES

Daily Remote Check – A check of all facility systems for proper function of all elements and any outstanding alarms.

Weekly Onsite Check – An onsite visual check of the of the Toll Zone area. All debris, litter, etc. shall be removed from the Toll Zone area. Generators will be visually inspected for leaks and damage. A weekly generator exercise of 20 minutes will be scheduled and verified that the exercise was performed. All electrical panels will be inspected for damage or issues that require additional investigation. The Vault building will be checked for any visual issues such as water leaks, security issues, or other issues. Resolve all issues discovered.

Monthly Onsite Check – An in-depth, maintenance of the Toll Zone area. Enclosures will be inspected for damage and corrosion. Debris, dirt, insect and pest nests, and other foreign bodies will be removed from all housings, panels, and vent/air passages. All visual indicators for devices will be verified to be operational and not indicating errors. Any unusual noises or odors will be investigated. A Thermal Analysis will be performed on all power distribution panels and associated equipment. The Automatic Transfer Switch shall be tested to ensure proper operation. Parking area lighting will be verified functional.

Annual Onsite Check – An in-depth, maintenance of the Toll Zone area. Generator engine oil and oil filter shall be replaced. Generator battery shall be replaced. All generator filters shall be replaced. The generator coolant system shall be inspected. Perform a grounding resistance test for the installed ground rods. Each vault building will have an inspection performed by a qualified structural contractor. The structural report shall be delivered to NCTA.

Attachment 4
ITS, AET, & RTCS As-Builts

The following 2 documents are "paper clipped" to this Attachments file for ease of reference: 1) *Monroe ITS As-Built Plans* 2) *Selected Pages from Monroe Expwy RTCS Installation Design*

Attachment 5
Project Responsibility Matrix

Project Responsibility Matrix	
Item	**Responsible Party**
Operations and Maintenance	
Roadway and Civil Infrastructure	NCTA or NCDOT
Maintenance of RTCS, Transaction Reconciliation Host (TRH) (all levels)	RTCS Contractor
ITS Equipment and Network	NCDOT ITS Resiliency Contractor
V2X Equipment	RTCS Contractor
Level I and II Maintenance of AVI Transponder Reader Equipment	RTCS Contractor
Level III Maintenance of Automatic Vehicle Identification (AVI) Transponder Reader Equipment	RTCS Contractor
Toll Facility Infrastructure	RTCS Contractor

Attachment 6
Equipment Re-Use Matrix

Monroe Expressway
Attachment 6: Equipment Reuse Matrix

		TransCore CPC	TransCore RTCS Server Blades	DVAS Camera	TransCore Plaza Server	42U Computer Rack	RTCS Lane Equipment (Lanes)	AVI Readers (Kapsch MPR)	AVI Lane Equipment	Plaza Buildings	Toll UPS Units	Quad-Door Cabinet w/HVAC Unit
Equipment that shall be replaced/discarded		X	X	X	X	X	X	X	X		X	X
Equipment that shall be reused										X		
Location												
	Metrolina Traffic Management Center (Toll Host)	1										
M01	74 BYP EB, US74 to IT-Frvw		6	2		1	4	1	4	1	1	1
M02	74 BYP WB, IT-Frvw to US74		6	2	1		4	1	4			1
M03	74 BYP EB, IT-Frvw to Uvill-IT		6	2			4	1	4	1	1	1
M04	74 BYP WB, Uvill-IT to IT-Frvw		6	2			4	1	4			1
M05	74 BYP EB, Uvill-IT to RockyRvr		6	2			4	1	4	1	1	1
M06	74 BYP WB, RockyRvr to Uvill-IT		6	2			4	1	4			1
M07	74 BYP EB, RockyRvr to US601		6	2	1	1	4	1	4	1	1	1
M08	74 BYP WB, US601 to RockyRvr		6	2			4	1	4			1
M09	74 BYP EB, US601 to MgnMill		6	2			4	1	4	1	1	1
M10	74 BYP WB, MgnMill to US601		6	2			4	1	4			1
M11	74 BYP EB, MgnMill to AusChny		6	2			4	1	4	1	1	1
M12	74 BYP WB, AusChny to MgnMill		6	2			4	1	4			1
M13	74 BYP EB, AusChny to US74		6	2			4	1	4	1	1	1
M14	74 BYP WB, US74 to AusChny		6	2			4	1	4			1
	Total	**1**	**84**	**28**	**2**	**2**	**56**	**14**	**56**	**7**	**7**	**14**

Attachment 7
OBO ICD

NORTH CAROLINA
Turnpike Authority

Draft

RTCS-OBO File Exchanges – Interface Control Document

North Carolina Turnpike Authority
Operational Back Office System Project

June 2026

Version 2.1

Table of Contents

Figures & Tables

Reference Documents

The following documents in their last edition/revision are applicable to this document.

Table 1: Documents Referenced

Document Name
NCTA Business Policies

Document Updates

Submittal/Transmittal

Table 2: Submittal/Transmittal

Submittal	Transmittal

Version History

Table 3: Version History

Version Number	Date	Description	Author
1.0	12/30/2025	Initial submission	G Vari
1.1	2/20/2025	Image File Spec Changes, Formatting, Deleted Image Source, TagProtocol fields changed, Image file naming added	A Khokhar, G Vari
2.0	6/15/2026	Image File Spec Changes, Tran Ack changes, added VendorCode, VehicleWidth/Length/Height now required.	A Khokhar
2.1	6/22/2026	Image File Spec Change	S Ranganathan, A Khokhar

1. Introduction

The following document outlines the specifications of the file format to be used in conjunction with the current and future Roadside Toll Collection System (RTCS) and Operational Back Office (OBO). All data specified is transmitted over HTTPS: JSON (JavaScript Object Notation) APIs or secure file exchange. The following table details each data exchange included in this document.

Table 4: Data Exchanges

Data Exchange	Format	Push/Pull	Method /Protocol	Service/Server Hosted by	Frequency
TRAN	JSON	RTCS push to OBO	REST API	OBO	Continuously – 24/7
ACK	JSON	Receiver of subject data exchange pushes ACK to originator	REST API	Varies	Correlates to frequency of subject data exchange
Video Image File	JSON	RTCS pushes all images to OBO	REST API	RTCS/OBO	Continuously – 24/7
DVAS Video File	JSON	OBO pushes request to RTCS RTCS pushes response to OBO	REST API	RTCS/OBO	Continuously – 24/7

The data transmitted over REST API protocol shall use batch sizes of 1 record to reduce the transmission failure over network.

The following general rules apply to API/files:

- API's will be authenticated using roadway facility specific API Keys to be shared at the time of integration.
- API keys will be generated and provided by the entity hosting the service(s).
- Required fields are marked as
    - Y = Required field
    - N = Field is not required, it is optional
    - C = Required based on the condition listed in the Description/Valid Values field
- If a data field is not applicable to a particular record, the element can be skipped in the JSON object.
    - The element does not have to be included in the data structure as an empty string, the entire element can be skipped.
- All data elements referencing time used in the file name format and in the file, contents are designated in UTC (Universal Time Coordinated), should include milliseconds and by default are assumed to 0 offset.

- If the value of a field in a record is outside the list of allowed values, the record will be rejected/skipped depending on the specific rules of each record.
- Additional validation rules for non-multiple value fields will be included in this ICD (Interface Control Document) for each file to determine if a file or record should be rejected/skipped.
- Any other error (transmission error, timeouts, service not available, etc.) not defined in the acknowledgement codes, the JSON messages should be retried once an hour for up to 12 hours.
    - The source agency should alert the receiver of any failures based on applicable service level agreements.
- All reports exchanged between the OBO and RTCS systems will use the acknowledgement time as the time period, to allow same time period between system reports.
- Standard HTTP response codes, such as 200 for successful transmissions and other appropriate responses (4XX and 5XX) for other errors or service unavailability will be utilized.

2. Transactions

Transaction (TRAN) data is created by the RTCS system to inform the Operational Back Office System (OBO) of the transactions, trips or other defined records constructed by the RTCS at a detailed level. This transaction includes a unique serial number of the transaction that is generated by the RTCS system. Frequency of transmitting transactions from RTCS to BOS is as frequent as possible.

2.1 TRAN Data

Table 5: Transaction (TRAN) Data – Detail Structure

Field Name	Type/Size	Required Field	Description/Valid Values
RecordType	String	Y	O, R, C, or I Record Types: ='O' for Original Transaction ='R' for Resubmittal (Once a transaction has posted to an account, it cannot be resubmitted. BOS DISP codes will determine Resubmittal eligibility) (Future use) ='C' Correction (Once a transaction has been posted to an account, it can be corrected if needed. BOS DISP codes will determine correction eligibility) (Future Use) = 'I' Information Only (RTCS reject - will be stored for reporting purposes) Note: Corrections and Resubmissions are expected for future use.

Field Name	Type/Size	Required Field	Description/Valid Values
TrxSerialNum	Numeric	Y	Numeric and Non-negative The unique ID of a transaction assigned by the Facility. Receive Value as is. No padding is required. Values: 0 – 99999999999999999999
ResubmittalReason	Numeric	C	Required field if Record Type is 'R' 2-digit number code A code denoting the reason for Resubmittal. Values: i.e. 01 – Resubmittal due to developer error 02 – Resubmittal due to service provider (OBO) error
ResubmittalCount	Numeric	C	Required field if Record Type is 'R' 1-9 The number of times that the Transaction has been resubmitted by the Subscriber/Facility.
CorrReason	Numeric	C	Required field if Record Type is 'C' 01-05 A code denoting the reason for the correction. Values: 01 – Resolved misclass: class and toll (as applicable) corrected 04 – Corrected plaza/lane information 05 – Corrected toll only
Facility	String	Y	Facility of Originating transactions T33 – Reserved for Triangle Expressway T40 – Used for I-77 Express Lanes T41 – Used for Monroe Expressway T42 – Used for I-485 Express Lanes
SubscriberId	String	Y	Indicates the Subscriber/Facility providing the transaction for back-office processing. C33
EntryPlaza	String	C	Required based on business rules. Facilities that consider entry plaza in toll calculations should provide this information. Refer to the IAG specifications in Appendix C, ETC_FAC_AGENCY plaza code of the plaza at which the vehicle entered the facility.
EntryLane	String	C	Required based on business rules. Facilities that consider entry plaza in toll calculations should provide this information. The entry lane number in which the transaction occurred. Valid values 0- 9999

Field Name	Type/Size	Required Field	Description/Valid Values
EntryDateTime	DateTime	C	Required based on business rules. Facilities that consider entry plaza in toll calculations should provide this information. UTC "YYYY-MM-DDThh24:mm:ss.fff"
ExitPlaza	String	Y	Refer to the IAG specifications in Appendix C, ETC_FAC_AGENCY plaza code of the plaza at which the vehicle entered the facility.
ExitLane	String	Y	The exit lane number in which the transaction occurred. Valid values 0- 9999
ExitDateTime	DateTime	Y	UTC "YYYY-MM-DDThh24:mm:ss.fffZ"
LaneMode	String	N	The mode the lane was operating in at the time of the Transaction. Values: E – ETC Only (Dedicated) – Default for NCTA Expressway and Express Lane facilities A – ETC/ACM M – Manned/ETCC – Manned/ETC with Carpool confirmation V – Evacuation
TagNumber1	String	C	Required if a transponder is associated with the transaction record. This includes the agency id prefix. Tag serial number read from the tag and conformed to NCTA format per NCTA Business Policies.
TagNumber2	String	C	Required if 2 transponders are associated with the transaction record. This includes the agency id prefix. Tag serial number read from the tag and conformed to NCTA format per NCTA Business Policies.
TagNumber3	String	C	Required if 3 transponders are associated with the transaction record. This includes the agency id prefix. Tag serial number read from the tag and conformed to NCTA format per NCTA Business Policies.
TagDeclaration1	String	C	Required field if a TagNumber is Provided 1= LOV (Default) 2=HOV 2 (as read from the tag) 3=HOV 3+ (as read from the tag)

Field Name	Type/Size	Required Field	Description/Valid Values
TagDeclaration2	String	C	Required field if a TagNumber2 is Provided 1= LOV (Default) 2=HOV 2 (as read from the tag) 3=HOV 3+ (as read from the tag)
TagDeclaration3	String	C	Required field if a TagNumber3 is Provided 1= LOV (Default) 2=HOV 2 (as read from the tag) 3=HOV 3+ (as read from the tag)
TagProtocol1	String	N	The protocol(s) read by the Roadside reader. Values: T – TDM S – SeGo 6 – 6C Note: If a tag supports multiple protocols, report the protocol used to determine tag number.
TagProtocol2	String	N	The protocol(s) read by the Roadside reader. Values: T – TDM S – SeGo 6 – 6C Note: If a tag supports multiple protocols, report the protocol used to determine tag number.
TagProtocol3	String	N	The protocol(s) read by the Roadside reader. Values: T – TDM S – SeGo 6 – 6C Note: If a tag supports multiple protocols, report the protocol used to determine tag number.

Field Name	Type/Size	Required Field	Description/Valid Values
VIN	String	N	Vehicle Identification Number collected from V2X system 17 characters Ex: SALME11425A187861
VehicleClass	String	Y	Values 1-3 1 = 2 Axles 2 = 3 Axles 3 = 4+ Axles Default value = 1 for roadways without axle-based classifications
VehicleSpecialClass	String	C	Required for express lane facilities. Refer to Appendix D: Special Vehicle Class Codes
Axles	Numeric	Y	Actual axles of the vehicle. Values 0-9 Default value = 2 if not available
PeakRate	String	C	Required for Roadways that use Time of Day or Dynamic pricing. No – Off-Peak (Default) Yes – Peak value
VehicleLength	Decimal	Y	Required for Roadways that use length-based classification. Length in feet as a decimal(18.5’)
VehicleWidth	Decimal	Y	Width in feet as a decimal
VehicleHeight	Decimal	Y	Height in feet as a decimal
IsExtendedVehicle	String	C	Required for Roadways that use length-based classification. Values “Yes” or “No”
ETCTollAmount	Decimal	Y	Toll Amount to be posted for AVI/prepaid transactions. Values -9999.99 to 9999.99

Field Name	Type/Size	Required Field	Description/Valid Values
ETCDiscountType	String	C	Required for roadsides that provide discounts. This would be populated with the agreed upon discount codes (between BOS and the RTCS systems) before implementation of a discount. I-77 will use these codes to indicate valid HOV declaration from any available channel for a tag with valid status. 000 = No Discount 001 = Facility Discount (NCTA Operated facilities use this Discount Type for all applicable discounts) 002 = HOV 006 – Nonreciprocal ETC Full Fare (“Reserved for future use. Advanced notification will be provided before this option is activated by NCTA”.) 007 = HOV violators (Used by I-77) 008 = HOV violators – Invalid Transponder (Used by I-77) 009 = HOV violators – Invalid Vehicle Length (Used by I77)
ETCOrigTollAmount	Decimal	C	Required for roadsides that provide discounts. The Total Transponder Toll Amount before any discount is applied. The discount type is denoted in Transponder Discount Type. Values: -9999.99 to 9999.99
VideoTollAmount	Decimal	Y	Toll Amount to be posted for Video (BBM) transactions. Values -9999.99 to 9999.99

Field Name	Type/Size	Required Field	Description/Valid Values
VideoDiscountType	String	C	Required for roadsides that provide discounts. This would be populated with the agreed upon discount codes (between BOS and the RTCS systems) before implementation of a discount. I-77 will use these codes to indicate valid HOV declaration from any available channel for a tag with valid status. 000 = No Discount 001 = Facility Discount (NCTA Operated facilities use this Discount Type for all applicable discounts) 002 = HOV 006 = Nonreciprocal ETC Full Fare (“Reserved for future use. Advanced notification will be provided before this option is activated by NCTA”.) 007 = HOV violators (Used by I-77) 008 = HOV violators – Invalid Transponder (Used by I-77) 009 = HOV violators – Invalid Vehicle Length (Used by I77)
VideoOrigTollAmount	Decimal	C	Required for roadsides that provide discounts. The Total Video Toll Amount before any discount is applied. The discount type is denoted in Transponder Discount Type. Values: -9999.99 to 9999.99
RegisteredVideoTollAmount	Decimal	Y	Toll Amount to be posted for Registered Video transactions. Values -9999.99 to 9999.99

Field Name	Type/Size	Required Field	Description/Valid Values
RegisteredVideoDiscountType	String	C	Required for roadsides that provide discounts. This would be populated with the agreed upon discount codes (between BOS and the RTCS systems) before implementation of a discount. I-77 will use these codes to indicate valid HOV declaration from any available channel for a tag with valid status. 000 = No Discount 001 = Facility Discount (NCTA Operated facilities use this Discount Type for all applicable discounts) 002 = HOV 006 = Nonreciprocal ETC Full Fare (“Reserved for future use. Advanced notification will be provided before this option is activated by NCTA”.) 007 = HOV violators (Used by I-77) 008 = HOV violators – Invalid Transponder (Used by I-77) 009 = HOV violators – Invalid Vehicle Length (Used by I77)
RegisteredVideoOrigTollAmount	Decimal	C	Required for roadsides that provide discounts. The Total Registered Video Toll Amount before any discount is applied. The discount type is denoted in Transponder Discount Type. Values: -9999.99 to 9999.99
NumberOfImages	Numeric	Y	Number of images associated with the Transaction.
OCRLicNumber	String	Y	OCR read plate number for the best image Default value is ‘****’
OCRLicState	String	Y	OCR read plate state for the best image Character abbreviation Default value is ‘**’
OCRLicCountry	String	Y	OCR read plate country for best image. Character abbreviation Default value is ‘**’
OCRLicType	String	Y	Required for jurisdictions requiring plate type, per NCTA Business Rules. Default Value is “***”
OCRPlateConfidenceValue	Numeric	Y	0 to 999 – Represents the OCR confidence level of OCRLicNumber value

Field Name	Type/Size	Required Field	Description/Valid Values
OCRStateConfidenceValue	Numeric	Y	0 to 999 – Represents the OCR confidence level of OCRLicState value
OCRCountryConfidenceValue	Numeric	Y	0 to 999 – Represents the OCR confidence level of OCRLicCountry value
OCRTypeConfidenceValue	Numeric	Y	Required if OCRLicType is provided. 0 to 999 – Represents the OCR confidence level of OCRLicType value. Default Value is "***"
OCROverallConfidenceValue	Numeric	Y	0 to 999 – Represents an overall OCR confidence level of the combined OCR value outputs

2.1.1 Sample JSON

Bad OCR, 2 Transponders Transaction Example

{

"RecordType" : "O",

"TrxSerialNum" : 12344567,

"Facility" : "T33",

"SubscriberId" : "C33",

"ExitPlaza" : "T14",

"ExitLane" : "01",

"ExitDateTime" : "2022-09-14T00:00:00.999",

"LaneMode" : 1,

"TagNumber1" : "00330000011122",

"TagDeclaration1" : 1,

"TagNumber2" : "00010000012345",

"TagDeclaration2" : 1,

"TagProtocol": "T",

"VehicleClass" : 1,

"Axles" : 2,

"PeakRate" : "N",

"EtcTollAmount" : 0.35,

"EtcDiscountType" : "000",

"EtcOrigTollAmount" : 0.35,

"VideoTollAmount" : 0.54,

"VideoDiscountType" : "000",

"VideoOrigTollAmount" : 0.54

"RegisteredVideoTollAmount" : 0.35,

"RegisteredVideoDiscountType" : "000",

"RegisteredOrigTollAmount" : 0.35

" OCRLicNumber" : "****"

" OCRLicState" : "NC"

"OCRLicCountry" : "US"
"OCRPlateConfidenceValue" : 7

"OCRStateConfidenceValue" : 100

"OCRCountryConfidenceValue" : 100

"OCROverallConfidenceValue" : 20

}

Good OCR, No Transponder Transaction Example

{

"RecordType" : "O",

"TrxSerialNum" : 12344568,

"Facility" : "T41",

"SubscriberId" : "C33",
"ExitPlaza" : "F15",

"ExitLane" : "01N",

"ExitDateTime" : "2022-09-15T00:00:00.999",

"VehicleClass" : 1,

"Axles" : 2,

"PeakRate" : "N",

"VehicleLength" : 18.5,

"IsExtendedVehicle" : "No",

"EtcTollAmount" : 0.35,

"EtcDiscountType" : "000",

"EtcOrigTollAmount" : 0.35,

"VideoTollAmount" : 0.00,

"VideoDiscountType" : "002",

"VideoOrigTollAmount" : 0.54

"RegisteredVideoTollAmount" : 0.35,

"RegisteredVideoDiscountType" : "000",

"RegisteredOrigTollAmount" : 0.35

"NumberOfImages" : 2,

"ImageSource" : 1,

"OCRLicNumber" : "ABC123",

"OCRLicState" : "NC",

"OCRPlateConfidenceValue" : 850,

"OCRStateConfidenceValue" : 900

"OCRCountryConfidenceValue" : 900

"OCROverallConfidenceValue" : 890

}

2.2 TRAN_ACK sent from OBO to RTCS

A transaction acknowledgement (TRAN_ACK) returned by the OBO after each transaction is processed by transaction receiver.

Table 6: Transaction Acknowledgement (TRAN_ACK)

Field Name	Type/Size	Description/Valid Values
ReturnCode	Numeric	A code indicating the status of the transaction being acknowledged. Values: Good ACK 00 – Transaction was successfully received and verified Bad ACK* 02 – Detail record(s) found with data preventing use of corresponding details. 03 – Transaction submitted as resubmittal but not eligible for resubmittal 04 – Transaction submitted as correction but not eligible for correction
ErrorDescription	String	String indicating what the error is (only required when sending 02 ack)
AckDateTime	DateTime	Date acknowledged. Format: UTC "YYYY-MM-DDThh24:mm:ss.fffZ" (Used for Reporting between RTCS and BOS)

*Bad ACKs will require manual review of the record by the ACK recipient to identify the issue with the record and determine appropriate action based on case-by-case conditions.

3 Image File (.JPG)

The Image (.JPG) file is created by the RTCS system to inform the OBO of the images corresponding to the video transactions generated at the RTCS.

The RTCS is expected to transfer all images taken for any vehicle passing a tolling point/gantry irrespective of whether the vehicle contained a tag or not. The RTCS system is to capture and transmit multiple front and rear images of all vehicles passing the gantry and at minimum one good image of the front of the vehicle and one good image of the rear of the vehicle. If there are additional images of the front or rear captured, these are expected to be transmitted to the OBO.

In addition, the RTCS is to perform high quality OCR on the captured images and create a ROI image. When created, RTCS should transmit the ROI Image to the OBO.

The transferred images are expected to be of good quality to be used for further OCR/Automated License Plate processing. Hence the expectation is that these images are provided with no compression or if any compression algorithm is used, it is expected to be a "lossless compression" technique to not impact the quality of the images being transmitted to the OBO and should be capable of full OCR processing.

3.1 Image File Specification

Table 7: Image File Specification Structure

Field Name	Type/Size	Description/Valid Values
TrxSerialNumber	Numeric	Numeric and non-negative The unique ID of a transaction assigned by the Facility. Receive Value as is. No padding is required. Values: 0 – 99999999999999999999
TotalNumberOfImages	Numeric	Total Number of Images for the Transaction represented by TxnSerialNumber. Should match the value provided in the TRAN submission
FrontImages	Group	Array of Front Images
NumberOfFrontImages	Numeric	Values 1 – 99
FrontImagesBinaries	Array of 1-nn	Array containing the binary image stream files for all front-facing images captured for the transaction.
ImageBlob	Binary	An array of Binary Image stream(s) of the Image(s) The Binary Image Stream shall be base 64 encoded
RearImages	Group	Array of rear Images
NumberofRearImages	Numeric	Values 1 - 99
RearImagesBinaries	Array of 1-nn	An array of binary image stream files for all rear-facing images captured for the transaction.
ImageBlob	Binary	An array of Binary Image stream(s) of the Image(s) The Binary Image Stream shall be base 64 encoded
ROIImage	Binary	NULL – ROI Image not generated and hence not sent. Binary Image stream(s) of the ROI Image. The Binary Image Stream shall be base 64 encoded

3.1.1 Sample JSON

Image File Example

```
{
        "TrxSerialNumber" : 7891234,
        “TotalNumberOfImages”: 9,
        “FrontImages": [
                “NumberOfFrontImages”,4
                 “FrontImageBinaries”:[
                                        {“ImageBlob “ : “binary string”},
                                        {“ImageBlob “ : “binary string”},
                                        {“ImageBlob “ : “binary string”},
                                        {“ImageBlob “ : “binary string”},
                                        ]
                    ]
        “RearImages": [
                “NumberOfResrImages”,4
                 “RearImageBinaries”:[
                                        {“ImageBlob “ : “binary string”},
                                        {“ImageBlob “ : “binary string”},
                                        {“ImageBlob “ : “binary string”},
                                        {“ImageBlob “ : “binary string”},
                                        ]
                    ]
         “ROIImage”:”binary string”
}
```

4 Video File

OBO will request video file to be provided by RTCS via API. OBO will integrate video file to meet user interface requirements. When VideoName = 1, the JSON shall include a DeliveryLocation identifying where the video file can be retrieved. The receiving system shall retrieve the video file from the DeliveryLocation provided.

File specifications:

- Codec = H.264
- Resolution = 1920 x 1080
- Profile = High
- Level = 4.1
- Frame Rate = 30
- Aspect Ratio = 16:9
- Bitrate: 12000 kbps
- Color Space": BT.709

Table 8: Video File Specification Structure

Field Name	Type/Size	Description/Valid Values
VideoName	Numeric	0 – Video(s) not available 1 – Video(s) available
DeliveryLocation	String	Signed URL or path where the video binary can be retrieved. Format: https://tbd.tbd/videos/YYYY/MM/DD/HH/SS/TollZone/LaneID/Facility_Tollzone_LaneIDYYYYMMDDHHMMSSFFF.mp4

4.1.1 Sample JSON

{

"VideoName": 1,

"DeliveryLocation":"https://tbd.tbd/videos/2026/02/08/00/09/35/M06/36N/485_M06_36N20260208000935000153S_1.mp4",

}

Appendix A: Acronyms

Table 9: List of Acronyms

Acronym	Definition
ACK	Acknowledgement file
API	Application Programming Interface
BOS	Back Office System

CSC	Customer Service Center
CSV	Comma Separated Values
DISP	Transaction Disposition
ETC	Electronic Toll Collection
FTP	File Transfer Protocol
IAG	Interagency Group
ICD	Interface Control Document
JSON	JavaScript Object Notation
NCTA	North Carolina Turnpike Authority
OBO	Operational Back Office
RTCS	Roadside Toll Collection System
XTAG	Tag Status File

Appendix B: List of Plaza Codes

Refer to "IAG Inter-CSC Files – Appendix" document and look for below tabs:

- App B (1) & B (2) – Plaza Codes

https://www.e-zpassiag.com/interoperability/87-interoperability/file-specifications/332-file-specifications

Appendix C: Special Vehicle Classes

Table 10: Vehicle Special Class Codes Express Lanes

VehicleSpecialClass	Name	Description
101	Low Occupancy Vehicles	2 axle motor vehicles, other than Motorcycles, without trailers, with the following dimensions: Length <= 20' Width <= 8.5' Height <= 12' Which has not been declared as HOV using one of the accepted channels.
102	High Occupancy Vehicles	2 axle Motor vehicles, without trailers, with the following dimensions: Length <= 20' Width <= 8.5' Height <= 12' Which has been declared as HOV using one of the accepted channels.
103	Motorcycles	Motor vehicles, with 2 or 3 wheels not larger than a LOV
104	Special Vehicles	Vehicles meeting one or more of the following characteristics: • Length > 22' • Width > 8.5' • Height > 12' • Vehicle with Trailer • More than 2 axles The toll amount is a multiplier of 1. (CSR will be Any transaction before this cutoff date - 2/1/2023, will require I-77 to provide the multiplier amount).
105	Exempt	Vehicles identified as Non-Revenue through a Transponder
106	Transit Vehicles	Vehicles with a tag with status "Transit Vehicle" in the relevant XTAG file
107	First Responders	Vehicles with a tag with status "First Responder" in the relevant XTAG file
108	Special Vehicles – Off Peak	Vehicles meeting one or more of the following characteristics: • Length > 22' • Width > 8.5' • Height > 12' • Vehicle with Trailer • More than 2 axles The toll amount is a multiplier of 2.

VehicleSpecialClass	Name	Description
109	Special Vehicles – Peak	Vehicles meeting one or more of the following characteristics: • Length > 22’ • Width > 8.5’ • Height > 12’ • Vehicle with Trailer • More than 2 axles The toll amount is a multiplier of 3.

All elements within this appendix are to be considered as general business rule guidelines. Actual business rule applications related to Special Vehicle Classes are to be defined and documented per project.

Appendix D: List of Plate Types

Table 115: Plate Types

State	Plate Type Code	Description
IL	31	Apportioned
IL	35	Handicap
IL	44	Disabled Vanity
IL	46	Standard
IL	57	Semi-Trailer
IL	77	B Truck
IN	27	Support Our Troops passenger
IN	30	National Guard
IN	31	Apportioned
IN	34	Disabled Veteran
IN	35	Handicap
IN	42	Initial Passenger
IN	43	Initial Veteran Motorcycle
IN	45	Motorcycle
IN	46	Standard
IN	47	Automobile Dealer
IN	48	Used Car Dealer
IN	49	Veteran Motorcycle
IN	50	Regular Veteran
IN	61	Ambulance
IN	62	Authority Motorcycle
IN	63	Authority
IN	64	Bus

State	Plate Type Code	Description
IN	65	Camper
IN	67	Municipal
IN	68	Municipal Motorcycle
IN	69	School Bus
IN	70	School Bus Pupil
IN	71	Semi-Trailer
IN	72	State Motorcycle
IN	73	State Vehicle
IN	75	Trailer
IN	77	Truck
IN	79	Truck (9,000 LB Weight Class)
IN	88	Purple Heart
ME	26	Street Rod
ME	31	Apportioned
ME	32	Commercial
ME	34	Disabled Veteran
ME	35	Handicap
ME	45	Motorcycle
ME	46	Standard
ME	47	Dealer
ME	48	Used Car Dealer
ME	49	Veteran Motorcycle
ME	50	Veteran
ME	61	Ambulance
ME	64	Bus
ME	65	Motorhome

State	Plate Type Code	Description
ME	66	Hire
ME	67	Municipal
ME	68	Municipal Motorcycle
ME	69	School Bus
ME	70	School Bus Pupil
ME	71	Semi-Trailer
ME	73	State Vehicle
ME	75	Trailer
ME	77	Truck
ME	78	Combination
ME	80	Antique Auto
ME	87	Lobster
ME	97	University Of Maine
MA	31	National Guard
MA	32	Apportioned
MA	34	Commercial
MA	35	Disabled Veteran
MA	45	Handicap
MA	46	Motorcycle
MA	50	Standard
MA	61	Regular Veteran
MA	62	Ambulance
MA	63	Authority Motorcycle
MA	64	Authority
MA	65	Bus
MA	66	Camper

State	Plate Type Code	Description
MA	67	Livery
MA	68	Municipal
MA	69	Municipal Motorcycle
MA	70	School Bus
MA	71	Bus (Pupils)
MA	72	Semi-Trailer
MA	73	State motorcycle
MA	74	Official State Police
MA	75	Taxi
MA	76	Trailer
MA	80	Van Pool
MA	82	Antique Vehicle
MA	84	Dealer
OH	31	Apportioned
OH	35	Handicap
OH	45	Motorcycle
OH	46	Standard
OH	47	Dealer
OH	50	Vietnam Veteran
OH	68	Sheriff Motorcycle
OH	75	Trailer
OH	77	Truck
OH	80	Historical Vehicle

Appendix E: List of Plate States/Provinces and Countries

Table 12: List of Plate States/Provinces and Countries

Country	State Code	State/Province
US	AA	Armed Forces America
US	AE	Armed Forces Europe
US	AK	Alaska
US	AL	Alabama
US	AP	Armed Forces Pacific
US	AR	Arkansas
US	AS	American Samoa
US	AZ	Arizona
US	CA	California
US	CO	Colorado
US	CT	Connecticut
US	DC	District of Columbia
US	DE	Delaware
US	FL	Florida
US	FM	Federated States of Micronesia
US	GA	Georgia
US	GU	Guam
US	HI	Hawaii
US	IA	Iowa
US	ID	Idaho
US	IL	Illinois
US	IN	Indiana

Country	State Code	State/Province
US	KS	Kansas
US	KY	Kentucky
US	LA	Louisiana
US	MA	Massachusetts
US	MD	Maryland
US	ME	Maine
US	MH	Marshall Islands
US	MI	Michigan
US	MN	Minnesota
US	MO	Missouri
US	MP	Northern Mariana Islands
US	MS	Mississippi
US	MT	Montana
US	NC	North Carolina
US	ND	North Dakota
US	NE	Nebraska
US	NH	New Hampshire
US	NJ	New Jersey
US	NM	New Mexico
US	NV	Nevada
US	NY	New York
US	OH	Ohio
US	OK	Oklahoma
US	OR	Oregon
US	PA	Pennsylvania
US	PR	Puerto Rico

Country	State Code	State/Province
US	PW	Palau
US	RI	Rhode Island
US	SC	South Carolina
US	SD	South Dakota
US	TN	Tennessee
US	TX	Texas
US	US	US Government
US	UT	Utah
US	VA	Virginia
US	VI	Virgin Islands
US	VT	Vermont
US	WA	Washington
US	WI	Wisconsin
US	WV	West Virginia
US	WY	Wyoming
CA	AB	Alberta
CA	BC	British Columbia
CA	MB	Manitoba
CA	NB	New Brunswick
CA	NL	Newfoundland and Labrador
CA	NS	Nova Scotia
CA	NT	Northwest Territories
CA	NU	Nunavut
CA	ON	Ontario
CA	PE	Prince Edward Island
CA	QC	Quebec

Country	State Code	State/Province
CA	SK	Saskatchewan
CA	YT	Yukon
MX	MX	Aguascalientes
MX	MX	Baja California
MX	MX	Baja California Sur
MX	MX	Campeche
MX	MX	Chiapas
MX	MX	Chihuahua
MX	MX	Coahuila
MX	MX	Colima
MX	MX	D.F
MX	MX	Durango
MX	MX	Guanajuato
MX	MX	Guerrero
MX	MX	Hidalgo
MX	MX	Jalisco
MX	MX	México
MX	MX	Michoacán
MX	MX	Morelos
MX	MX	Nayarit
MX	MX	Nuevo León
MX	MX	Oaxaca
MX	MX	Puebla
MX	MX	Querétaro
MX	MX	Quintana Roo
MX	MX	San Luis Potosí

Country	State Code	State/Province
MX	MX	Sinaloa
MX	MX	Sonora
MX	MX	Tabasco
MX	MX	Tamaulipas
MX	MX	Tlaxcala
MX	MX	Veracruz
MX	MX	Yucatán
MX	MX	Zacatecas

Attachment 8
Lane Closure Restrictions

ALLOWABLE LANE CLOSURE TIMES AND LIQUIDATED DAMAGES (LANE RENTAL FEES)

A. Full Road Closures

1. Full roadway closures are allowed only between **11:00 PM and 5:00 AM**.
2. Requires **≥1 week notice**, and establishment of a **signed and approved detour**.
3. Liquidated damages apply per *Part V, Section 1.4.1 Liquidated Damages of the RFP*.

B. Nighttime Single Lane Closures

1. **Work Hours:** Lane closures permitted only between **9:00 PM and 5:00 AM**.
2. **Lane Closures:**
    - Only **one lane** may be closed at a time per direction; opposing directions may close simultaneously.
    - Maximum closure length is **2 miles**, with minimum **2-mile spacing** between separate closures in the same direction.
3. **Traffic Control Notification:** Provide **≥3 calendar days' notice** prior to lane closures.
4. **On-site Contact:** A responsible **Person of Contact (POC)** must be present throughout lane closures. All changes to Traffic Control must be coordinated to the corresponding TMC by the POC prior to traffic control changes.
    - **Metrolina: Hours of Operation 5:30AM – 9:30PM. Supervisor Desk (704) 342-6814**
    - **STOC: Hours of Operation 24/7. Supervisor Desk (919) 825-2608**
5. **Queue Management:** If traffic queue length exceeds **1 mile**, adjust operations or remove traffic control and reopen the lane (if possible).
6. **Ramp Management:** All ramps must remain open during lane closures unless otherwise approved.

C. Daytime Single Lane Closures

Lane closures are prohibited outside the following windows on two-lane or divided facilities:

Direction	Allowed Closure Window
Westbound	10:00 AM – 4:00 PM
Eastbound	9:00 AM – 3:00 PM

D. Ramp Closures

1. All Ramp closures require **≥7 calendar days' notice**.
2. A **signed, approved detour (signed in accordance with MUTCD and Roadway Standards)** shall be in place prior to closure.
3. Detour Routes will be provided by NCTA.

E. Liquidated Damages

Nonadherence to any aforementioned time restrictions, closures, or reopening requirements will result in **$500 per 15-minute period** of violation or any portion thereof, per *Part V, Section 1.4.1 Liquidated Damages of the RFP*.

F. Holiday and Special Event Restrictions

The Contractor shall **not close or narrow a lane**, detain or alter traffic flow during the following unless directed by the Engineer:

- New Year's
- Easter
- Memorial Day
- Independence Day
- Labor Day
- Thanksgiving
- Christmas
- Other high-traffic generating events as directed by Engineer

Attachment 9
Future Transaction Projections

DRAFT

Estimated Annual Transactions For Monroe Expressway
2026 Forecast Update
(in thousands)

Fiscal	Class 1				Classes 2 and 3				All Vehicles			
Year	BBM	ETC	Total	% ETC	BBM	ETC	Total	% ETC	BBM	ETC	Total	% ETC
2026	19,842	26,829	46,670	57.5	1,213	4,802	6,015	79.8	21,054	31,631	52,685	60.0
2027	19,287	28,033	47,320	59.2	1,179	4,888	6,067	80.6	20,465	32,921	53,387	61.7
2028	18,727	29,252	47,979	61.0	1,145	4,974	6,119	81.3	19,872	34,226	54,098	63.3
2029	18,165	30,482	48,647	62.7	1,111	5,060	6,172	82.0	19,277	35,542	54,818	64.8
2030	17,602	31,722	49,324	64.3	1,079	5,146	6,225	82.7	18,681	36,868	55,549	66.4
2031	17,287	32,633	49,920	65.4	1,065	5,229	6,295	83.1	18,352	37,862	56,214	67.4
2032	17,219	33,213	50,432	65.9	1,072	5,310	6,381	83.2	18,290	38,523	56,813	67.8
2033	17,150	33,799	50,949	66.3	1,078	5,392	6,470	83.3	18,227	39,191	57,418	68.3
2034	17,079	34,392	51,471	66.8	1,084	5,475	6,559	83.5	18,163	39,867	58,030	68.7
2035	17,007	34,991	51,999	67.3	1,090	5,560	6,650	83.6	18,097	40,551	58,648	69.1
2036	16,934	35,598	52,532	67.8	1,096	5,645	6,741	83.7	18,031	41,243	59,273	69.6
2037	16,860	36,210	53,070	68.2	1,102	5,732	6,835	83.9	17,963	41,942	59,905	70.0
2038	16,785	36,830	53,615	68.7	1,108	5,820	6,929	84.0	17,893	42,650	60,544	70.4
2039	16,709	37,456	54,164	69.2	1,115	5,910	7,025	84.1	17,823	43,366	61,189	70.9
2040	16,631	38,089	54,720	69.6	1,121	6,001	7,122	84.3	17,752	44,090	61,841	71.3
2041	16,611	38,703	55,314	70.0	1,125	6,086	7,211	84.4	17,735	44,789	62,524	71.6
2042	16,648	39,301	55,948	70.2	1,127	6,164	7,292	84.5	17,775	45,465	63,240	71.9
2043	16,685	39,907	56,591	70.5	1,130	6,244	7,374	84.7	17,815	46,151	63,965	72.1
2044	16,722	40,522	57,244	70.8	1,132	6,325	7,457	84.8	17,854	46,846	64,701	72.4
2045	16,759	41,146	57,905	71.1	1,135	6,406	7,541	85.0	17,894	47,552	65,446	72.7
2046	16,767	41,713	58,480	71.3	1,134	6,480	7,614	85.1	17,901	48,193	66,094	72.9
2047	16,745	42,220	58,965	71.6	1,131	6,545	7,676	85.3	17,876	48,765	66,642	73.2
2048	16,723	42,734	59,457	71.9	1,128	6,611	7,739	85.4	17,852	49,345	67,196	73.4
2049	16,701	43,254	59,955	72.1	1,125	6,677	7,802	85.6	17,827	49,930	67,757	73.7
2050	16,679	43,779	60,459	72.4	1,123	6,744	7,866	85.7	17,802	50,523	68,325	73.9
2051	16,652	44,310	60,961	72.7	1,118	6,812	7,931	85.9	17,770	51,122	68,892	74.2
2052	16,618	44,846	61,463	73.0	1,113	6,881	7,995	86.1	17,731	51,727	69,458	74.5
2053	16,584	45,387	61,971	73.2	1,108	6,951	8,059	86.2	17,692	52,339	70,031	74.7
2054	16,550	45,936	62,486	73.5	1,103	7,022	8,125	86.4	17,653	52,957	70,611	75.0
2055	16,517	46,490	63,007	73.8	1,098	7,093	8,191	86.6	17,615	53,583	71,198	75.3
2056	16,483	47,051	63,534	74.1	1,093	7,166	8,259	86.8	17,576	54,217	71,793	75.5
2057	16,450	47,618	64,068	74.3	1,088	7,239	8,327	86.9	17,538	54,857	72,395	75.8
2058	16,416	48,193	64,609	74.6	1,083	7,312	8,395	87.1	17,499	55,505	73,004	76.0
2059	16,383	48,773	65,156	74.9	1,078	7,387	8,465	87.3	17,461	56,160	73,621	76.3
2060	16,350	49,361	65,711	75.1	1,073	7,462	8,535	87.4	17,423	56,823	74,247	76.5
2061	16,317	49,956	66,273	75.4	1,068	7,538	8,606	87.6	17,385	57,494	74,879	76.8
2062	16,284	50,558	66,842	75.6	1,063	7,615	8,678	87.7	17,347	58,173	75,521	77.0
2063	16,251	51,168	67,418	75.9	1,058	7,693	8,751	87.9	17,309	58,860	76,170	77.3
2064	16,218	51,784	68,002	76.2	1,054	7,771	8,825	88.1	17,272	59,555	76,827	77.5
2065	16,185	52,408	68,594	76.4	1,049	7,850	8,899	88.2	17,234	60,259	77,493	77.8
2066	16,153	53,040	69,193	76.7	1,044	7,930	8,974	88.4	17,197	60,970	78,167	78.0
2067	16,120	53,679	69,799	76.9	1,039	8,011	9,050	88.5	17,159	61,690	78,849	78.2
2068	16,087	54,326	70,413	77.2	1,034	8,093	9,127	88.7	17,122	62,419	79,541	78.5
Average Annual Percent Change												
2026-35	-1.7%	3.0%	1.2%		-1.2%	1.6%	1.1%		-1.7%	2.8%	1.2%	
2035-45	-0.1%	1.6%	1.1%		0.4%	1.4%	1.3%		-0.1%	1.6%	1.1%	
2045-68	-0.2%	1.2%	0.9%		-0.4%	1.0%	0.8%		-0.2%	1.2%	0.9%	
2026-68	-0.5%	1.7%	1.0%		-0.4%	1.3%	1.0%		-0.5%	1.6%	1.0%	

Note: The values provided are forecasted. Apply appropriate factor of safety for applicable uses.

Attachment 10

KPI Guidebook

KPI Guidebook

General Information

The Contractor shall produce a monthly report, detailing the result of each KPI assessment with relevant detailed backup, resulting points and impact toward the monthly invoice for services.

Each KPI shall be assessed individually on a monthly basis.

Point escalation rules shall be applied as detailed in the Contract.

Any single event shall only impact a single KPI, relative to system function. The KPI with the lowest number shall take precedent over KPI's further down the list. KPI's tied to human activities, including KPI's 8 through 10, are not granted exception due to other KPI impacts. Examples:

- If there is an event which impacts KPI 1 – AET Lane Availability, any timeframe that event is applied to KPI 1 will be applied as exception to any other KPI, including transaction accuracy and timeliness. KPI 8 for MOT Notification and Setup still applies in full.
- If a transaction is assessed as a Vehicle Detection failure as part of KPI 2, this vehicle is not subject to assessment under KPI's 3 through 7 for other transaction accuracy elements.
- If a prime KPI is granted exception for a period of time (example: time between MOT request and implementation for lane availability) the exception to lower KPI's no longer apply.

All requested exceptions shall be detailed in the monthly reports and agreed upon by NCTA. It is preferred that ad hoc exceptions are identified, reviewed and approved as soon as they are identified, to limit challenges in reviewing bulk exception requests at the end of the month.

KPI 1 - AET Lane Availability

KPI 1 Requirement

Each Toll Zone must be available 99.9% of the time.

Availability = 1 – (chargeable downtime minutes/(minutes in assessment period – minutes in period granted as exception))

2 points for each 0.1% or portion thereof below the requirement, for each zone.

KPI 1 Assessment Methodology

Determine which system issues result in a lane or zone availability impact and which system alerts indicate these issues.

Develop a system report which uses open and resolved timestamps for the identified set of availability impacting tickets to calculate lane availability for each lane/zone, based on downtime/total time in assessment period. AET Lane availability is assessed at a zone level

granularity, so if multiple lanes or shoulders are determined unavailable at the same time, then the impact to availability is the same as if just the lane were unavailable.

Export the report on a monthly basis. Review for accuracy and make adjustments as needed based on exceptions or availability impacts not captured through the automated means described above.

KPI 1 Exceptions

Lanes may be down during periods of scheduled and approved maintenance (preventive maintenance activities).

When a lane closure is required to repair an issue, the downtime between when the Contractor requests approval for a lane closure and the start time of the approved lane closure may be granted as exception to the downtime assessment.

Force majeure

KPI 1 Evidence Package

Export of the System produced availability report with all applicable adjustments detailed and resulting points calculated.

A list of all events that impacted lane/zone availability with relevant details.

A list of all approved exceptions.

KPI 2 – Vehicle Detection

KPI 2 Requirement

The Contractor shall create a single transaction record for each vehicle passing through the toll point(s).

Vehicle Detection = (Number of properly formed transactions – duplicate transactions)/total number of vehicles in the audit period

For any month the vehicle detection audit results in an accuracy below 99.9%, the Contractor shall be assessed 1.0 point for each 0.1%, or portion thereof, below the requirement.

KPI 2 Assessment Methodology

The Contractor shall conduct scheduled manual audits of the lanes during rush hour conditions to measure compliance with the requirement.

The audits shall be scheduled at the beginning of each assessment period, targeting a number of lanes and durations to meet a target sample size for statistical significance.

The audit shall compare a continuous video feed from the DVR through the audit period against detail transaction records to validate one, and only one transaction has been produced for each vehicle.

Video analytics or other inputs from a system independent of the AVDC system may be used to validate detection accuracy and identify errors.

KPI 2 Exceptions

Force Majeure

Impacts from any events already assessed in preceding KPI's.

If there are conditions at the lane (degradation or other) that would result in exception to issues within the audit, the audit shall be rescheduled to another time in the future or, if future audit periods are not available, randomly select an audit window in the past in coordination with NCTA.

KPI 2 Evidence Package

Results of the manual audit(s) clearly showing all errors observed and any exceptions that may apply. The package should include the detail records for each audit, the resulting overall performance of each audit and the resulting overall performance and calculated points for the entire assessment period.

KPI 3 – Image Capture and Transmission Accuracy

KPI 3 Requirement

The contractor shall correctly capture and correlate front and rear images to transactions for each vehicle passing through the toll zone and deliver the appropriate images to the OBO upon request per the requirements and ICD. OCR data must be provided for all transactions.

Image Capture and Transmission Accuracy = number transactions with accurate image correlation and delivery / total number of transactions in the sample set

The Contractor is assessed 1 point for each 0.1%, or portion thereof, below the requirement of 99.9%.

KPI 3 Assessment Methodology

Utilize a report from the OBO, identifying any transaction that does not include the required image set.

This assessment may be augmented by a manual audit.

KPI 3 Exceptions

Force majeure

Impacts from any events already assessed in preceding KPI's.

KPI 3 Evidence Package

The evidence package shall be an export of the report from the OBO displaying the number of transactions with complete image sets and number of transactions with incomplete image sets.

KPI 4 – Classification Accuracy

KPI 4 Requirement

The Contractor shall accurately classify all vehicles for proper fare assignment.

Vehicle Classification = (Number of properly classified vehicles)/total number of vehicles in the audit period

For any month the vehicle classification audit results in an accuracy below 99.5%, the Contractor shall be assessed 1.0 point for each 0.1%, or portion thereof, below the requirement.

KPI 4 Assessment Methodology

Two potential options:

1. Replicate or supplement the vehicle detection audit, reviewing for classification accuracy. Manual audit of transaction records, images and video to determine classification accuracy within pre-scheduled audit windows.
2. Replicate AVI capture and correlation methodology, with a focus on proper representation of vehicle types/classifications rather than transponder protocols. Develop a KCL of known users with transponder, license plate and classification data which is used to extract a sample from the population and measure accuracy by comparing against expected values listed in the KCL.

KPI 4 Exceptions

Impacts from any events already assessed in preceding KPI's.

If there are conditions at the lane (degradation or other) that would result in exception to issues within the audit, the audit shall be rescheduled to another time in the future.

KPI 4 Evidence Package

Results of the audit(s) clearly showing all errors observed and any exceptions that may apply. The package should include the detail records for each audit, the resulting overall performance of each audit and the resulting overall performance for the entire assessment period with resulting points calculated.

KPI 5 – Image Quality

KPI 5 Requirement

The RTCS shall provide images of sufficient quality to ensure that less than 0.1% of the image transactions are rejected for reasons within Contractor's control.

Image quality = (1 – number of image transactions rejected in IVS for reasons under the Contractor's control) / total number of image transactions within the assessment period.

The Contractor is assessed 1 point for each 0.1%, or portion thereof, they fall below the performance requirement of 99.9%.

KPI 5 Assessment Methodology

The OBO will provide a report to summarize the total number of image transactions rejected in IVS for each defined reason. All Image reject codes are defined as "Controllable" or "Uncontrollable". The total number of image transactions rejected for "Controllable" reasons will be used in the equation listed in the Requirements section above. The sample for this assessment is the entire population of image-based transactions within the assessment period, other than those removed as exception.

KPI 5 Exceptions

Force majeure

Impacts from any events already assessed in preceding KPI's.

KPI 5 Evidence Package

The OBO will provide the Image Reject/Quality report discussed above. The Contractor can supplement this report with any applicable notes, exceptions or adjustments needed. Final points should be calculated and included in the report.

All exceptions shall be listed and detailed.

KPI 6 – AVI Accuracy

KPI 6 Requirement

The Contractor shall correctly read and assign properly mounted transponders to the correct vehicle and report the correct declared transponder status for 99.5% of the vehicles passing through the tolling points.

AVI Capture and Correlation = Total number of transactions with correctly captured and correlated transponders / total number of transactions in the sample

The Contractor shall be assessed 1 point for each 0.1%, or portion thereof, below the requirement of 99.5%.

KPI 6 Assessment Methodology

The OBO will provide an AVI performance report, utilizing transaction data provided by the RTCS. The report will be produced by a tool that will involve a list of common and known commuters which exhibit "good" AVI usage behavior, meaning that they consistently use a properly mounted transponder and present low variability in their vehicle conditions, such as pulling a trailer and causing license plate variability. This list will be representative of all required transponder protocols (TDM, 6C and SeGo), vehicle types seen on the facility and toll location usage. This list will be maintained monthly and will be referred to as the Known Commuter List (KCL). The KCL will include both transponder and license plate information for each vehicle included.

After the KCL has been updated for a given month, filtering out bad users and backfilling with good new users as needed, the KCL will be compared against the entire population of transactions that occurred within the assessment period (generally the month under audit) and extract any transaction which matches either the transponder or license plate number of a KCL member.

A statistically significant sample set is then randomly extracted from the total list of KCL matches to serve as the audit sample set. Using this data, automated processes are applied to detect any AVI transponder read or association errors based on any mismatch between expected transponder and license plate value pairs. All detected failures are then manually reviewed for confirmation or exception.

The results from the audit are then applied to the equation listed in KPI7 Requirement.

The RTCS Contractor shall provide NCTA and their OBO provider with all information on Availability impacts during the assessment month, so that they can remove those timeframes from consideration during sample selection.

KPI 6 Exceptions

Vehicles travelling in the wrong direction.

Vehicles determined as "bad users" within the audit sample set, determined in an evidence-based manner with other transactions in the same trip.

Force Majeure

Impacts from any events already assessed in preceding KPI's.

Any approved exceptions should be removed from the sample and replaced to maintain minimum sample size.

KPI 6 Evidence Package

The evidence package shall include the monthly KCL from OBO, the resulting performance and calculated points.

All exceptions should be listed and detailed.

KPI 7 – Transaction Complete and Timely Transmission to OBO

KPI 7 Requirement

The Contractor shall process and transmit all transactions to NCTA developed OBO within four (4) hours after the vehicle travels through the tolling point.

Transaction Timeliness = Number of image-based transactions delivered to OBO within 4 hours / Total number of transactions within assessment period.

For any month the Transaction Complete and Timely Transmission assessment falls below 100%, the Contractor is assessed 1 point for each 0.1%, or portion thereof, below the requirement.

KPI 7 Assessment Methodology

Develop a system report which measures the timeliness of each transaction delivery (delivery timestamp to OBO – transaction timestamp at lane), reports the number of transactions falling both within and outside the requirements and calculate the percentage of transactions outside compliance. The report should present this information for each transaction day and then summarize totals at the bottom for the total period the report was run. The reference time for the report will be the transaction timestamp. So, for example, a transaction that occurred in the lane at 11:58 PM on 1/31 but sent to OBO at 12:10 AM on 3/1 would be included in the January assessment.

The OBO will provide a reconciliation report to ensure alignment of data related to the receipt of transactions and images.

Apply applicable exceptions for final assessment.

KPI 7 Exceptions

Force Majeure events outside Contractor control.

Impacts from any events already assessed in preceding KPI's.

Apply exceptions at a day level granularity, so if an event is granted as an exception, remove all transactions from that day from the timeliness calculation.

KPI 7 Evidence Package

An export of the system generated Transaction Timeliness report with all exceptions and adjustments detailed and resulting points calculated.

KPI 8 – MOT Notification and Setup

KPI 8 Requirement

The Contractor shall notify NCTA and NCDOT of all MOT placed on the project during the maintenance period. NCTA must approve all MOT before work commences. Once approved, all MOT implementations shall conform to NCDOT Standard Specifications for Roads and Structures.

KPI 8 Assessment Methodology

The Contractor shall maintain a log of all MOT's implemented. The logs shall include the closure location, type of closure, reason for closure, date/time scheduled to be implemented, date and time the closure was actually implemented, date/time the MOT was submitted to NCTA for approval, whether approval was granted, date/time the approval was granted and whether the lane closure was implemented according to NCDOT Standards.

A noncompliance event for KPI8 will be missing data for the approval submission and response fields or marked "no" in the field indicating whether the closure was implemented according to NCDOT Standards. The contractor shall provide evidence of any submissions or approvals upon request.

KPI 8 Exceptions

There are no general exceptions. Circumstances of an exception request will be reviewed on a case-by-case basis, considering factors such as the safety of the driving public.

KPI 8 Evidence Package

The Contractor shall provide the lane closure log described in the Assessment Methodology, identifying any non-compliance events or exceptions and calculating total points.

The evidence package shall include a detailed description of any non-compliance event, discussing the circumstances and the strategies to prevent similar issues in the future.

KPI 9 – Wrong Way Vehicle Detection and Notification Testing

KPI 9 Requirement

The Contractor shall conduct a test of the wrong day detection and alerting functionality required by the toll zone as part of every preventive maintenance activity that includes a closure of the travel lane.

The Contractor will be assessed 1 point for each occurrence where either the test was not conducted as required or the System did not meet requirements for wrong way vehicle detection and alerting during the test.

KPI 9 Assessment Methodology

The Contractor shall drive a vehicle through the toll zone travelling opposite the direction of normal traffic any time a preventive maintenance lane closure is implemented. Personnel must be logged

into the interface to validate receipt of the alert. The maintenance team shall coordinate with TMC personnel beforehand to ensure they are aware of the wrong way event test.

The Contractor shall maintain a log of preventive maintenance events which required lane closures and evidence of the WWVD test, with corresponding details correlating to the scheduled closure.

The Contractor shall provide a system generated report showing timestamps for the wrong way detection event and the time the alert was generated, along with a manually generated test report validating the alert was received on time and functioned as expected with accurate information and a 5 second looping video.

KPI 9 Exceptions

Delays in the alert that fall outside Contractor scope.

KPI 9 Evidence Package

A log of all preventive maintenance activities which required lane closure, annotated to indicate the execution of the WWVD test activity and result. To support this, a system generated report of the wrong way events associated with the testing shall be provided. The records shall list any occurrence of noncompliance and total points.

Any exceptions shall be listed and detailed.

KPI 10 – Preventative Maintenance Completeness

KPI 10 Requirement

The Contractor shall complete all scheduled Preventative Maintenance for the RSS, ITS, and Facilities.

KPI 10 Assessment Methodology

The Contractor shall maintain updated work orders for all Preventative Maintenance activities. The work orders shall include the location, maintenance type, date/time start, date/time completed, checklist of all activities performed with acknowledgment of each line item, description of any non-conforming items, and technician performing or overseeing the work.

A noncompliance event for KPI 10 will be missing data for the completed section or the completed date/time is beyond the schedule for the work order.

KPI 10 Exceptions

Deferred maintenance due to circumstances such as prolonged severe weather as approved by NCTA.

KPI 10 Evidence Package

The Contractor shall provide a monthly report of all preventative maintenance.

The evidence package shall include a detailed description of any non-compliance event, discussing the circumstances and the strategies to prevent similar issues in the future.

Attachment 11

Transition Impact Fees

The following 2 documents are "paper clipped" to this Attachments file for ease of reference: 1) *Att 11_Monroe Replacement RTCS_Transition Impact Fees - 2028 Rates_LOCKED* 2) *Att 11_Monroe Replacement RTCS RFP_Transition Impact Fee Example*

Attachment 12
Transition Requirements

Table of Contents

MONROE EXPRESSWAY 2026 RTCS RFP - TRANSITION REQUIREMENTS

This document contains transition requirements for the Contractor to transition from the legacy RTCS to the new RTCS on the Monroe Expressway with minimal disruption to customer travel conditions and revenue collection operations.

SECTION 1. LEGACY TOLL COLLECTION SYSTEM

The existing RTCS was originally installed and placed into revenue service by the legacy toll system provider in November of 2018. The Monroe Expressway utilizes seven (7) bidirectional tolling locations (14 toll zones), each of which uses a set of two box trusses with a spacing of approx. 50 feet between centers. These trusses span the entire width of the roadway at approx. 130 ft. in width in both directions. There are multiple horizontal trusses connected between each box truss over the travel lanes and shoulders. Vehicle detector/profilers, lane AVI antenna, and rear image capture cameras are mounted to each of these structures. The lane straddle AVI antenna and front image capture camera as well as a second laser vehicle detector/separator, are all mounted to the downstream truss.

There are equipment cabinets and a vault (shelter) measuring approximately 12 ft. by 15 ft located in the eastbound direction at each toll zone. The roadway travel lanes and shoulders have in-pavement traffic sensors or loops for vehicle detection and classification that will be removed by a roadway resurfacing project after the legacy system is replaced.

SECTION 2 AS-BUILT DRAWINGS

As-built drawings for the existing Monroe Expressway RTCS are contained in **Attachment 4: ITS, AET, & RTCS As-Builts**.

The Contractor shall reuse the existing toll vault buildings and shall provide all other necessary materials as new for this project. All existing equipment shall be replaced as listed in **Attachment 6: Equipment Re-Use Matrix**, to meet the Requirements of this Scope of Work and Requirements and all Performance Requirements.

The Contractor shall transition the new RTCS to replace the existing RTCS on the Monroe Expressway in a carefully coordinated manner, one toll zone at a time.

SECTION 3. TRANSITION REQUIREMENTS

3.1 Roadway System Transition

1000.	The Contractor shall provide a Transition Plan for NCTA Approval that addresses the transition of the new RTCS into revenue collection operations, as specified in this document.
1001.	The Contractor shall perform the transition from the existing RTCS to the new RTCS in accordance with the Approved schedule.

1002.	The Contractor shall be responsible for compensating NCTA for any lost revenue due to impacts to legacy RTCS operations during transition activities. It is the Contractor's responsibility to make sure there is sufficient infrastructure (e.g., space, power, cooling) to support their transition plans.
1003.	The Contractor shall prevent any damage or alteration to the aesthetic cladding on the overhead toll gantry at all locations.
1004.	The Contractor shall survey all existing Monroe Expressway RTCS infrastructure and determine what, if any, major and minor toll infrastructure construction-related activities are anticipated to implement and transition to the new RTCS. The Contractor shall inform NCTA of any issues with available toll infrastructure, including limited space in the Communications Vaults.
1005.	The Contractor shall include the system transition plan as a topic for the System Detailed Design Review workshops (see RFP Part III, Section 3.3.1). The Contractor shall identify any potential conflicts or issues anticipated in either the design or installation of the new RTCS as a section within the System Detailed Design Document (see RFP Part III, Section 3.3.2).
1006.	The Contractor shall identify any potential impacts this transition work may have on existing toll Operations or customers travel and communicate this information to NCTA for review, discussion, and approval prior to any field work.
1007.	The Contractor shall provision for additional conduits and mounting structures as needed to support their transition plan.
1008.	Any temporary re-location of existing Equipment shall be identified and documented by the Contractor and all such relocations shall be Approved by NCTA. The Contractor shall relocate the existing Equipment if Approved.
1009.	The Contractor's implementation process shall accommodate all onsite testing at the locations identified by NCTA.
1010.	The new RSS shall be Commissioned and interfaced with the NCTA OBO system to process transactions before the first toll lane or toll zone is transitioned to revenue collection by the new RTCS.
1011.	The Contractor shall accommodate the various phases of the RTCS implementation in accordance with the NCTA Approved schedule.
1012.	All changes to the RTCS to accommodate technology upgrades and meet the Contract Requirements shall be the responsibility of the Contractor.
1013.	The Installation and Commissioning of the new RTCS shall be performed in accordance with the requirements found in RFP Part III, Section 3.10. Installation and Transition Plan.
1014.	After each Toll Zone has been transitioned to revenue collection in the new RTCS, the Contractor shall monitor the System Operations. All new RTCS toll Equipment shall be configured and tuned to their optimal performance before the start of the Operational Test. The Operational Test shall commence when the Contractor meets the Operational Test entry criteria.
1015.	The Contractor shall decommission all existing toll RTCS systems and related equipment as approved by NCTA at each Toll Facility.

1016.	Unless otherwise directed by NCTA, the Contractor shall be responsible for the removal and disposal of all decommissioned equipment, including mounting brackets and arms, cabinets and enclosures, electronics, cabling, and any debris generated from the activity.
1017.	The disposal of all decommissioned equipment and infrastructure shall be in accordance with NCDOT and State of North Carolina and U.S. rules and regulations.
1018.	The Transition Plan shall address the transition of the new RTCS to revenue collection operations. An updated Transition Plan for NCTA review and approval shall be provided no later than 90 days prior to Go-Live of the first new Toll Zone.
1019.	The Contractor shall work and cooperate with the legacy Toll System Integrator to determine the activities required to transition the legacy RTCS in an orderly manner and to allow the transition to occur without interruption of services or operations under the existing Contract.
1020.	The Contractor shall ensure that there is no duplication, corruption or loss of transactional data and images, and no impact to the network, OBO, or the CBOS during the Transition. The contractor shall compensate NCTA or its contractors for any impacts associated with transition activities.
1021.	The Transition Plan shall identify any resources and/or tasks needed from NCTA, NCDOT, the existing Toll System Integrator, and any third-party subcontractor to complete the transition to the new RTCS.
1022.	The Transition plan shall detail all communication protocols to be used throughout the transition process.
1023.	The Transition Plan shall address the integration and interface of the RTCS to the NCTA OBO as well as existing interfaces/Equipment (if applicable). All temporary changes and modifications to the infrastructure to accommodate the transition shall be described.
1024.	The Transition Plan shall address the transition sequence for toll collection operations from the legacy RTCS to the new RTCS.
1025.	The Contractor's plan for decommissioning, demolition, and disposal of the existing RTCS equipment shall be included in the Transition Plan.
1026.	The Transition Plan shall include the installation, testing, commissioning, and transition from revenue collection in the legacy RTCS to revenue collection in the new RTCS.
1027.	The contractor is not permitted to use any legacy toll equipment as part of their new system during the transition or any time thereafter.
1028.	The Contractor shall propose how they will power the new RTCS during installation and testing of the new RTCS. The Contractor shall propose how they will integrate the existing Automatic Transfer Switch (ATS) and generator.
1029.	All points of coordination or reliance on third-party Deliverable, for example, the WAN communications network, shall be clearly identified in the Transition Plan.
1030.	The Contractor shall coordinate all transition activities with NCTA and the existing Toll System Integrator.
1031.	To ensure a seamless transition, the following activities shall take place prior to Cutover of any Tolling Locations.
	a) The RTCS shall be installed and commissioned and its interface to the existing NCTA OBO shall be validated.

	b) NCTA shall give Approval for Go-Live. At such time, the new RTCS shall be switched to production mode and ready to begin collecting revenue.
	c) The Contractor shall be responsible for scheduling and providing the required lane closures during the transition as Approved by NCTA;
	d) The ITSM shall be configured for Go-Live; inventory recorded; technicians scheduled and all preventive and corrective notifications set up;
	e) The DVAS shall be installed and validated and Authorized NCTA personnel shall have access to the DVAS;
	f) The OIT shall be conducted and System functionality and performance validated at the OIT Tolling Locations and
	g) An end-to-end test shall be conducted in the RTCS and the NCTA OBO test environments to validate the flow of transactions and images from the Roadway System to the NCTA OBO.
	h) The contractor shall support the NCTA approved Maintenance Plan at the time of Go-Live of the first Toll Zone.

3.2 Key Personnel – Transition Manager

1032.	The Contractor shall designate a Transition Manager who shall serve as the single point of contact for all RTCS transition-related activities.
1033.	The Contractor's Installation/Maintenance Manager may serve in this capacity per NCTA's approval.
1034.	The Transition Manager shall have prior experience in similar transitions between legacy and replacement revenue systems.
1035.	The Transition Manager shall be responsible for the installation and commissioning of the RTCS and its external interfaces.
1036.	During the transition phase of the project, the Transition Manager shall work primarily in the project area and may be required to attend regular meetings at designated NCDOT offices as required to complete the work.
1037.	The Transition Manager shall be one hundred percent (100%) dedicated to the project during the installation and transition phase of the Project.

3.3 Transition Impact Fees

Contract terms governing Lane Rental Fees, provided in RFP Part V, Section 1.4.1. Liquidated Damages, shall be applied during the RTCS Transition and Cutover.

1038.	Transaction and revenue loss may occur during the transition from the legacy RTCS to the new RTCS. The Contractor shall assess these transition-related losses and compensate NCTA with Transition Impact Fees for the estimated losses.
1039.	The Contractor will be assessed Transition Impact Fees at a daily rate, based on historic transaction volumes as detailed in **Attachment 11: Transition Impact Fees**.
1040.	The Transition Impact Fees will begin to apply the moment the legacy RTCS is first impacted by Contractor activities and will continue until the Contractor and NCTA validate that the new RTCS is fully functional in accordance with the Approved design through a baseline performance assessment.

1041.	For each day subject to Transition Impact Fees, any transaction successfully provided to the OBO or CBOS will be deducted from the Transition Impact Fee assessment. An example application has been provided in **Attachment 11: Transition Impact Fees**.
1042.	Adjustments to the expected daily transaction volumes may be considered due to events such as a weather event, traffic incident, or roadway closure. Volume adjustments will be determined and applied using alternative traffic counting devices on the facility.

Attachment 13
Toll Location Photo Tour

Monroe Expressway Toll Location Photo Tour

1.0 Purpose

The following images are provided to support NCTA's understanding of the current installation of toll system equipment along the Monroe Expressway. AET-1 is used as the representative toll zone to illustrate the typical installation configuration observed across the corridor.

These images are not all-inclusive; however, they are intended to convey the standard arrangement and integration of building systems, gantry equipment, and associated infrastructure. Where installation conditions differ from the representative configuration, additional images and accompanying commentary may be included to highlight variations and provide context for site-specific conditions (Images taken June 2026).

2.0 Building (Ground Equipment Installation)

The images are similar in nearly all locations in the seven (7) AET Toll Sites. Some differences exist and are noted in the text.

2.1 Building Layout Front View

Date: 6/3/2026

Vault Area and Gantry Approach – Typical Layout

- **Toll Vault:**
  - Secure, standalone vault building located adjacent to the roadway
  - Enclosed by architectural screen walls for visual shielding and equipment protection
- **Screen Wall:**
  - Decorative/architectural wall surrounding the vault and generator area
  - Provides security, visual screening, and separation from roadway
- **Parking & Access:**
  - Paved access drive and parking area leading directly to vault entrance
  - Provides maintenance vehicle access to vault, generator, and roadside equipment
- **Ground Boxes:**
  - Multiple underground utility pull boxes located around vault and along roadside
  - Provide routing access for power and communications infrastructure
- **Gantry Foundations:**
  - Reinforced concrete foundations supporting overhead gantry structures
  - Located along roadway edge adjacent to vault area
- **Roadside Equipment:**
  - Equipment cabinets and utility infrastructure positioned near gantry supports
  - Connected to vault and gantry via underground conduit systems
- **Roadway Context:**
  - Multi-lane divided highway with shoulders and guardrails
  - Gantry spans active travel lanes for toll collection
- **General Layout:**
  - Compact and organized site design with clear separation between roadway operations, equipment zones, and maintenance access areas

2.2 Building Layout Rear View

Date: 6/3/2026

Vault Building – Rear Elevation (Typical Configuration)

- **Equipment (Left to Right):**
  - Utility revenue meter
  - Utility service disconnect
  - Automatic Transfer Switch (ATS)
  - Generator disconnect
  - Exterior HVAC unit(s)
  - Standby generator
  - Exterior motion/security lighting
- **Electrical Service:**
  - Utility service routed to meter and main disconnect, then through ATS for transfer between utility and generator power
  - Generator provides backup power and is integrated with ATS for automatic operation
- **HVAC:**
  - Primary HVAC unit mounted on exterior wall
  - Supplemental HVAC units present at select locations (e.g., AET-2 and AET-6)
- **Generator System:**
  - Propane-fueled generator located on concrete pad adjacent to building
  - Connected to buried propane tank located outside the screen wall
- **Lighting:**
  - Wall-mounted motion-activated light fixture for security and maintenance visibility
- **Installation:**
  - Equipment mounted to exterior wall and adjacent concrete pads
  - Conduit and piping routed along wall and into building
- **Typical vs. Site-Specific Conditions:**
  - Configuration shown is typical across sites
  - **Exception:** AET-6 includes a remote utility service located on the east side of the roadway, south of the toll zone
  - Overhead utility lines may be present, providing service to a nearby power pole and meter location

2.3 Generator

Date: 6/3/2026

Standby Generator (Vault Building)

- **Type:** Outdoor standby generator (Generac Industrial Power)
- **Fuel Source:** Propane, supplied from buried tank located outside screen wall
- **Electrical Output:** 200 amp service
- **Configuration:** Weatherproof, sound-attenuated enclosure
- **Operation:**
    - **Automatic start upon loss of utility power**
    - Integrated with Automatic Transfer Switch (ATS) for seamless transfer between utility and generator power
- **Installation:**
    - Mounted on concrete pad adjacent to vault building
    - Connected to propane fuel system via exterior regulator and piping
    - Electrical connection routed to ATS and distribution system
- **Function:**
    - Provides backup power to tolling, communications, and support equipment during utility outages

2.4 Generator Disconnect

Date: 6/3/2026

Generator Disconnect (Adjacent to ATS)

- **Type:** Outdoor safety disconnect switch
- **Rating:** 200 amp
- **Enclosure:** NEMA 3R (rainproof, outdoor rated)
- **Configuration:** Likely non-fused disconnect (no external fuse indicators visible)
- **Location:** Mounted to the right of the Automatic Transfer Switch (ATS) on vault building exterior
- **Operation:** Manual lever-operated disconnect handle located on side of enclosure
- **Function:** Provides isolation of generator power source for maintenance and service

2.5 Generator / Fiber Interface

Date: 6/3/2026

Fuel and Communications Infrastructure – Generator Area

- **Components:** Fiber ground box and propane regulator assembly
- **Location:** Inside screen wall, behind generator enclosure (right side)
- **Fiber Ground Box:**
  - Below-grade utility pull box for fiber optic communications
  - Provides access for splicing and routing communications to the vault and gantry systems
- **Propane Regulator:**
  - Exterior-mounted regulator and piping associated with buried propane tank system
  - Supplies regulated fuel to standby generator
- **Installation:**
  - Regulator mounted on vertical piping adjacent to concrete equipment pad
  - Conduit and piping routed between ground box, generator, and vault systems
  - Area finished with gravel for drainage and maintenance access

2.7 Roadside Equipment Cabinets

Date: 6/3/2026

Roadside Equipment – Opposite Side of Vault (Typical Arrangement)

- **Configuration (Left to Right):**
  - Dynamic Message Sign (DMS) Cabinet
  - Electrical Power Panels
  - Reader/Communications Cabinet
  - Gantry Support Upright (southeast corner)
- **Function:**
  - DMS cabinet supports roadside messaging equipment (where installed)
  - Power panels distribute electrical service to gantry and roadside equipment
  - Reader cabinet houses tolling communications and processing equipment
- **Installation:**
  - Equipment installed on concrete pads adjacent to roadway
  - Conduit connections route power and communications between cabinets, gantry, and vault
  - Located along roadway shoulder with guardrail protection
- **Applicability:**
  - DMS cabinets are **site-specific** and are **not present at all gantries or roadside locations**
- **Site Context:**
  - Equipment positioned near gantry support column for efficient routing to overhead systems
  - Maintenance access provided via shoulder and adjacent graded area

2.8 Automatic Transfer Switch Controls

Date: 6/3/2026

Automatic Transfer Switch (Vault Building)

- **Type:** Automatic Transfer Switch (ATS), UL 1008 listed
- **Model:** ASCO (or equivalent), Model TS 873A0200B1AY5
- **Electrical Rating:** 240V max, single-phase, 60 Hz
- **Amperage:** 200A (utility and generator)
- **Configuration:** Service entrance rated transfer switch
- **Enclosure:** NEMA 3R (outdoor rated)
- **Operation:** Automatic transfer between utility and generator power

2.9 Utility Disconnect

Date: 6/3/2026

Electrical Disconnect (Vault Building)

- **Type:** Outdoor safety disconnect switch
- **Enclosure:** NEMA 3R (rainproof)
- **Configuration:** Non-fused disconnect
- **Mounting:** Wall-mounted, exterior
- **Operation:** Manual lever-operated

NOTE: Generator starts on loss of utility power when enabled.

2.10 Power Meter

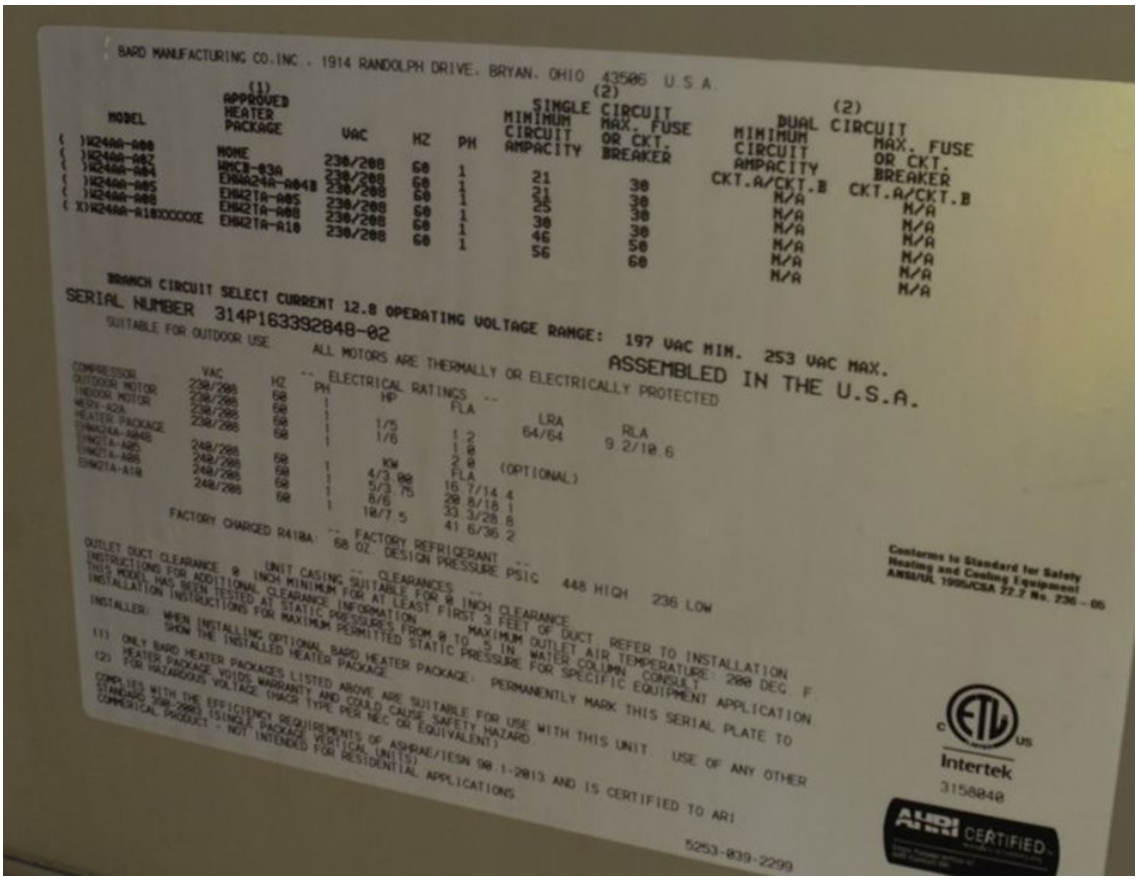
Date: 6/3/2026

AET-6 meter is mounted on the East side of the roadway south of AET-6.

Electrical Meter (Vault Building)

- **Type:** Digital utility revenue meter
- **Model/Series:** Landis+Gyr Focus kWh (or equivalent)
- **Service:** Union Power Cooperative
- **Electrical Service:** 240V, single-phase, 3-wire
- **Meter Class:** CL200
- **Measurement:** Kilowatt-hour (kWh) energy usage
- **Display:** Digital LCD readout

2.11 HVAC System



Date: 6/3/2026

HVAC Unit (Vault Building)

- **Type:** Packaged outdoor HVAC unit (Bard)
- **Cooling Capacity:** 2 tons (24,000 BTU/hr)
- **Electrical:** 208/230V, 1-phase, 60 Hz
- **Refrigerant:** R-410A

2.13 Propane Tank

Date: 6/3/2026

Propane Fuel System (Vault Building Generator)

- **Type:** Buried propane storage tank serving standby generator
- **Location:** Underground, north of screen wall
- **Components:** Tank access lid, regulator assembly, and protective bollard
- **Instrumentation:** Tank level monitoring via Hall-effect sensor
- **Connections:** Sensor wiring routed to vault building for monitoring

3.0 Gantry (Overhead Equipment Installation)

Date: 6/3/2026

Site Layout (Typical Tolling Location)

- **Orientation:** North is up (per aerial view)
- **Vault Building:** Located on the west (left) side of the roadway; houses tolling, communications, and electrical equipment
- **Gantry Structures:** Two overhead gantries span the roadway and support tolling equipment
- **Equipment Mounting:** Structural framing and transverse mounting pipes between gantries for antennas, cameras, and sensors
- **Ground Boxes:** Utility pull boxes located on both east and west sides of the roadway for power and communications distribution
- **Conduit Infrastructure:** Underground conduits interconnect the vault, ground boxes, and gantries
- **Access & Parking:** Designated maintenance parking areas and paved access drives on both sides of the roadway
- **Roadway Features:** Multi-lane roadway with shoulders and central median providing maintenance access and work zones
- **Site Protection:** Curbing and roadside barriers present along roadway edges
- **General Layout:** Organized equipment placement and cable routing consistent with all-electronic tolling (AET) installations

3.1 Gantry Mounted Equipment

Date: 6/3/2026

Gantry-Mounted Tolling Equipment

- **Structure:** Overhead gantry with galvanized steel framing and transverse mounting pipes
- **Equipment:** Includes tolling antennas, vehicle profiling sensors, cameras, and associated detection devices mounted across travel lanes
- **Mounting System:** Equipment installed on horizontal pipe runs and adjustable brackets to allow positioning over individual lanes
- **Cabling:** Exposed and routed cabling secured along mounting members, connecting devices to conduit systems at gantry structure
- **Coverage:** Equipment arranged to provide full lane-by-lane detection and transaction processing across all travel lanes
- **Cladding:** Architectural cladding panels installed on traffic-facing sides of the gantry for aesthetics and shielding of equipment
- **Access:** Gantry structure designed to allow maintenance access to mounted devices from roadway

3.2 Wiring, Security Camera, Box Transitions

Date: 6/3/2026

Gantry Wireway and Routing (Trailing Gantry – Building Side shown)

- **Type:** Overhead wireway system mounted to gantry structure
- **Configuration:** Wireway internally divided into separate compartments for **power** and **communications** cabling
- **Function:** Provides organized routing of field wiring from gantry-mounted equipment to ground systems
- **Cabling:** Equipment wiring is routed into the appropriate compartment (power vs. communications) prior to transition to conduit systems
- **Location:** Installed on the **trailing gantry**, building side (southbound direction)
- **Connectivity:** Interfaces with conduit runs down the gantry column to the vault and ground equipment
- **Symmetry:** Installation is a mirrored configuration of the leading gantry wireway and connections

3.3 DMS

Date: 6/3/2026

Gantry Elevation – South-Facing View (Typical Condition)

- **Orientation:** View facing south along the roadway corridor
- **Gantry Configuration:** Dual-gantry arrangement spanning all travel lanes, with leading and trailing structures visible
- **Mounted Equipment:** Tolling equipment (antennas, cameras, and sensors) installed on both gantries, providing full lane coverage
- **DMS Sign:** A Dynamic Message Sign (DMS) is mounted on the **leading gantry**, right (southbound) side of the roadway
- **Applicability:** DMS installations are **site-specific** and not present at all gantry locations
- **Cladding:** Architectural cladding panels installed along the traffic-facing side of the leading gantry
- **Roadway Layout:** Divided multi-lane roadway with central median separating opposing traffic directions
- **Access & Safety:** Guardrails, shoulders, and clear zones provided along roadway edges for maintenance access
- **Site Features:** Retaining/screen walls and graded embankments present adjacent to roadway

4.0 Installation Variations

4.1 [AET-2 and AET-6] Additional HVAC


Date: 6/3/2026

HVAC Equipment – Vault Building (Additional Units at Select Sites)

- **Type:** Split-system HVAC unit with exterior condenser (Daikin)
- **Configuration:** Wall-mounted/ground-mounted outdoor condensing unit connected to indoor equipment
- **Electrical:** 208/230V, single-phase, 60 Hz (typical)
- **Function:** Provides supplemental cooling for vault equipment loads
- **Typical Condition:**
    - Most sites include a single primary packaged HVAC unit serving the vault
    - **AET-2 and AET-6 include an additional auxiliary HVAC unit** to support increased equipment heat load
- **Installation:**
    - Outdoor condenser mounted on pad adjacent to vault building
    - Refrigerant and electrical lines routed through wall into building
    - Weatherproof conduit and line set protection provided