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NGORONGORO CONSERVATION AREA AUTHORITY

Software Requirements Specification

NCAA Digital Transformation - Gate Inspection Module

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www.ncaa.go.tz

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1 Document Information

Field	Value
Project Name	NCAA Digital Transformation - Gate Inspection Module
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Project Manager	TBD
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Qa Lead	TBD
Platforms	['Web', 'PWA', 'Desktop', 'Tablet']
Document Status	Draft
Module Code	INSPECTION
Parent Project	NCAA Digital Transformation - Ngorongoro Gateway System

2 Project Overview

2.1 What Are We Building

2.1.1 System Function

Automated vehicle inspection system using camera-based object detection to identify vehicles, verify credentials, and detect trailers. System integrates with gate operations to provide comprehensive vehicle tracking and credibility checks.

2.1.2 Users

- Gate Staff: Vehicle inspectors, Security personnel
- Management: Operations managers, Security managers
- System Operators: Technical staff monitoring camera systems

2.1.3 Problem Solved

Manual vehicle inspection is time-consuming and error-prone at gates handling 500+ cars/day (Seneto), lack of standardized inspection process, no automated vehicle detection, difficulty tracking vehicles with trailers, no vehicle credibility checks, narrow roads causing inspection bottlenecks

2.1.4 Key Success Metric

Automated vehicle detection in <5 seconds, 95% accuracy for vehicle type classification, trailer detection capability, vehicle credibility verification integrated with permit system, reduced inspection time from 2-3 minutes to <30 seconds per vehicle

2.2 Scope

2.2.1 In Scope

- Camera-based vehicle detection and classification
- License plate recognition (LPR)
- Vehicle type identification (car, jeep, bus, truck)
- Trailer detection using fine-tuned object detection models
- Adjustable camera system for varied vehicle heights

- Vehicle credibility verification against permit system
- Integration with vehicle logging module
- Image capture and archival for audit trail
- Real-time processing at gate locations
- Manual inspection fallback procedures

2.2.2 Out Of Scope

- Facial recognition for driver identification
- Automatic gate barrier control
- Weight measurement systems
- Cargo inspection systems
- Wildlife detection on vehicles
- Night vision capabilities (initial phase)

3 User Requirements

3.1 Vehicle Detection

Feature Code	I Want To	So That I Can	Priority	Notes
FT-INSP-DETECT-AUTO	Automatically detect vehicles approaching the gate	Trigger inspection process without manual intervention	Must	Motion detection triggers camera. Processing <5 seconds. Works in daylight conditions.
FT-INSP-DETECT-CLASSIFY	Classify vehicle type automatically (car, jeep, bus, truck)	Verify vehicle matches permit and enforce appropriate regulations	Must	95% accuracy target. Object detection model trained on safari vehicles. Manual override available.
FT-INSP-DETECT-PLATE	Recognize and extract license plate numbers	Automatically log vehicles and cross-reference with registration	Must	Tanzania plate format recognition. Fallback to manual entry if OCR fails.
FT-INSP-DETECT-TRAILER	Detect vehicles with trailers using fine-tuned object detection	Track additional equipment entering conservation area	Should	Model fine-tuning required per Nov 3 revision. Alert staff if trailer detected for additional verification.

3.2 Camera System

Feature Code	I Want To	So That I Can	Priority	Notes
FT-INSP-CAM-ADJUSTABLE	Use adjustable camera to capture vehicles of varied heights	Handle range from small cars to large safari buses	Must	Manual or automatic adjustment. Cover vehicle heights from 1.5m to 4m. Per Nov 3 revision feedback.
FT-INSP-CAM-ANGLES	Capture multiple angles of each vehicle (front, side)	Ensure complete vehicle documentation	Should	2-3 camera setup at critical gates. Single camera minimum at remote gates.
FT-INSP-CAM-QUALITY	Ensure high-quality image capture in various lighting conditions	Maintain detection accuracy throughout the day	Must	HD resolution minimum (1080p). Auto-exposure adjustment. Weather-resistant housing.
FT-INSP-CAM-ARCHIVE	Archive vehicle images for audit and dispute resolution	Maintain complete visual record of all vehicles	Must	Stored on local NAS. 30-day retention minimum. Compressed storage to manage space.

3.3 Credibility Verification

Feature Code	I Want To	So That I Can	Priority	Notes
FT-INSP-CRED-PERMIT	Verify vehicle matches permit information	Detect permit fraud and	Must	Cross-reference plate number with permit

Feature Code	I Want To	So That I Can	Priority	Notes
		unauthorized vehicles		database. Alert if mismatch. Currently manual process at Seneto.
FT-INSP-CRED-DRIVER	Verify driver authorization for the vehicle	Ensure authorized operators only	Must	Driver license check. Safari guide license for commercial operators. Manual verification by staff.
FT-INSP-CRED-COMMERCIAL	Verify commercial operator licenses for safari vehicles	Enforce commercial operation regulations	Must	Operator license database. Expiry date checks. Alert if license expired or invalid.
FT-INSP-CRED-BLACKLIST	Check vehicle against blacklist of prohibited vehicles	Prevent entry of vehicles with violations history	Should	Blacklist management interface. Reason codes for blacklisting. Expiry dates for temporary bans.

3.4 Integration

Feature Code	I Want To	So That I Can	Priority	Notes
FT-INSP-INT-LOGGING	Automatically create vehicle log entry when inspection complete	Eliminate manual logging of 1000+ vehicles/day	Must	Integration with gate operations module. Timestamp, plate, type, image reference logged.

Feature Code	I Want To	So That I Can	Priority	Notes
FT-INSP-INT-PERMIT	Link inspection results to permit verification system	Provide complete visitor-vehicle-permit validation	Must	Real-time lookup in permit database. Display permit status on inspection screen.
FT-INSP-INT-CAPACITY	Update capacity counts based on inspection results	Maintain accurate real-time capacity tracking	Must	Increment count on entry, decrement on exit. Vehicle type specific counts.

3.5 Staff Interface

Feature Code	I Want To	So That I Can	Priority	Notes
FT-INSP-UI-DASHBOARD	View real-time inspection dashboard showing camera feeds and detection results	Monitor inspection process and intervene when needed	Must	Live camera feed. Detection confidence scores. Manual override buttons.
FT-INSP-UI-OVERRIDE	Manually override automatic detection results	Correct errors and handle edge cases	Must	Edit vehicle type, plate number, trailer status. Reason required for override. Audit trail maintained.
FT-INSP-UI-ALERT	Receive visual and audio alerts for credibility issues	Take immediate action on vehicle violations	Must	Alert types: permit mismatch, blacklisted vehicle, expired license. Color-

Feature Code	I Want To	So That I Can	Priority	Notes
				coded urgency levels.
FT-INSP-UI-HISTORY	View vehicle inspection history	Identify repeat visitors and track vehicle patterns	Should	Search by plate number or date range. Show all previous inspections with images.

3.6 Manual Fallback

Feature Code	I Want To	So That I Can	Priority	Notes
FT-INSP-MANUAL-ENTRY	Manually enter vehicle details when camera system unavailable	Maintain operations during technical issues	Must	Form-based entry interface. Same data fields as automated. Tablet-friendly for mobile inspection.
FT-INSP-MANUAL-PHOTO	Capture vehicle photos using tablet camera as backup	Maintain visual documentation even when fixed cameras fail	Should	Tablet camera integration. Manual photo upload. Sync to central archive when network available.

3.7 Reporting

Feature Code	I Want To	So That I Can	Priority	Notes
FT-INSP-REPORT-DAILY	Generate daily inspection reports with detection accuracy metrics	Monitor system performance and identify issues	Should	Total vehicles inspected, detection success rate, manual

Feature Code	I Want To	So That I Can	Priority	Notes
				overrides, alerts triggered.
FT-INSP-REPORT-AUDIT	Generate audit reports showing all vehicle inspections with images	Support compliance and dispute resolution	Must	Filterable by date, gate, vehicle type. Export with images. PDF/ Excel formats.

4 Technical Requirements

4.1 Performance Standards

Requirement	Target	How To Test
Vehicle detection time	< 5 seconds from trigger to result	Automated testing with 100 vehicle samples
License plate recognition accuracy	≥ 90% accuracy	Test with 100 Tanzania plates in various conditions
Vehicle classification accuracy	≥ 95% accuracy	Test with diverse vehicle types (cars, jeeps, buses, trucks)
Trailer detection accuracy	≥ 85% accuracy	Test with vehicles with/ without trailers after model fine-tuning
Camera feed latency	< 500ms	Network latency testing from camera to NUC

4.2 Platform Requirements

Platform	Minimum Version	Target Version	Notes
Object Detection Model	YOLOv5 / TensorFlow 2.8	YOLOv8 / TensorFlow 2.13+	GPU acceleration recommended but not required
Camera System	IP Camera 1080p, H.264	IP Camera 4K, H.265, PoE	ONVIF compliant for compatibility
Processing	Intel NUC with Intel i5	Intel NUC with Intel i7 or integrated GPU	Sufficient for real-time inference at gate volumes

4.3 Security Privacy

Requirement	Must Have	Implementation
Image encryption	True	AES-256 encryption for archived images on NAS
Access control for images	True	Role-based access. Audit log for image access.
Data retention policy	True	30-day minimum retention, automatic archival to cold storage for longer retention

5 External Dependencies

5.1 Third Party Services

Service	What It Does	Criticality	Backup Plan
Object Detection Model (YOLO)	Vehicle and trailer detection	Critical	Manual inspection fallback
OCR Engine (Tesseract)	License plate text recognition	Critical	Manual plate entry

5.2 Device Requirements

Feature	Required	Optional	Notes
IP Camera (adjustable mount)	True	False	Weather-resistant, PoE powered, 1080p minimum, adjustable for vehicle heights per Nov 3 revision
Camera mounting hardware	True	False	Adjustable mount to cover varied vehicle heights (1.5m to 4m)
Network infrastructure	True	False	PoE switch for camera power, network cable to NUC

6 Release Planning

6.1 Development Phases

Phase	Features Included	Timeline	Success Criteria
Phase 1 (Model Training & Testing)	['Train vehicle detection model on safari vehicles', 'Train trailer detection model', 'License plate OCR for Tanzania plates', 'Accuracy testing and fine-tuning']	8 weeks	≥95% vehicle classification accuracy, ≥85% trailer detection accuracy, ≥90% plate recognition
Phase 2 (Pilot Deployment - 2 Gates)	['Camera installation at Karatu and Seneto', 'Real-time detection integration', 'Staff interface', 'Manual fallback procedures']	6 weeks	System operational at 2 gates, <5 second detection time, staff trained and confident
Phase 3 (Full Deployment)	['Camera installation at remaining critical gates', 'Integration with gate operations', 'Audit trail and reporting', 'Performance optimization']	8 weeks	All critical gates equipped, 90% of vehicles automatically inspected, staff workload reduced by 60%

6.2 Release Checklist

- Vehicle detection model trained and tested (≥95% accuracy)
- Trailer detection fine-tuned per Nov 3 revision (≥85% accuracy)
- Camera hardware installed with adjustable mounts
- Integration with vehicle logging completed

- Staff training completed on inspection interface
- Manual fallback procedures documented and tested
- Image archival system operational with 30-day retention
- Performance benchmarks met (<5 second detection)

7 Risks Assumptions

7.1 Risks

Risk	Probability	Impact	Mitigation
Model accuracy lower than expected in real-world conditions	Medium	High	Continuous model improvement, manual override capabilities, fallback to manual inspection
Camera visibility issues due to dust/ weather in conservation area	High	Medium	Weather-resistant camera housing, regular cleaning schedule, manual fallback
Processing power insufficient for real-time detection	Low	High	Hardware specifications validated during pilot, GPU acceleration option, model optimization
Varied vehicle types not well represented in training data	Medium	Medium	Collect local vehicle images during pilot, continuous model retraining, manual corrections fed back to model

7.2 Assumptions

- Vehicle detection models can achieve required accuracy with available training data
- Intel NUC processing power sufficient for real-time inference
- Camera placement locations available at all gates
- Network bandwidth sufficient for camera feeds

- Staff willing to trust and use automated system with manual oversight
- Adjustable camera mounts can cover full range of vehicle heights (per Nov 3 revision)

8 Market Specific Considerations

8.1 Primary Market

- Ngorongoro Conservation Area, Tanzania

8.2 Target Demographics

- Gate staff operating inspection systems
- Vehicle inspectors transitioning from manual to automated

8.3 Local Considerations

- Dusty environment requires rugged camera equipment
- High vehicle volumes during peak season (500+ cars/day at Seneto)
- Varied vehicle types from small cars to large safari buses
- Tanzania license plate formats and styles
- Safari vehicles often modified with roof hatches and racks
- Vehicles with trailers common for camping equipment (per Nov 3 revision)

8.4 Competition

- Manual inspection (current process)

9 Sign Off

9.1 Approval

Role	Name	Signature	Date

9.2 Document History

Version	Date	Changes Made	Changed By
1.0	2025-11-06	Initial draft based on gate inspection architecture and Nov 3 revision feedback	Development Team

10 Detailed Feature Requirements

10.1 Ft Insp Detect Auto

10.1.1 Priority

Must Have

10.1.2 User Story

As a gate inspector, I want vehicles to be automatically detected when approaching the gate so that the inspection process starts without manual intervention

10.1.3 Preconditions

Camera system operational; motion detection configured

10.1.4 Postconditions

Vehicle detected; inspection process triggered; detection time logged

10.1.5 Test Cases

Id	Description	Weight
INSP-DETECT-TC-001	Detect approaching vehicle within 5 seconds	High
INSP-DETECT-TC-002	Motion detection triggers camera capture	High
INSP-DETECT-TC-003	Detection works in daylight conditions	High
INSP-DETECT-TC-004	No false positives from pedestrians or animals	Medium

10.2 Ft Insp Detect Classify

10.2.1 Priority

Must Have

10.2.2 User Story

As a gate inspector, I want vehicle type to be automatically classified so that I can verify it matches the permit

10.2.3 Preconditions

Vehicle detected; object detection model loaded

10.2.4 Postconditions

Vehicle type classified with confidence score; result displayed to staff

10.2.5 Test Cases

Id	Description	Weight
INSP-DETECT-TC-005	Classify car with ≥95% accuracy	High
INSP-DETECT-TC-006	Classify safari jeep with ≥95% accuracy	High
INSP-DETECT-TC-007	Classify bus with ≥95% accuracy	High
INSP-DETECT-TC-008	Classify truck with ≥95% accuracy	High
INSP-DETECT-TC-009	Display confidence score to staff	Medium
INSP-DETECT-TC-010	Allow manual override of classification	High

10.3 Ft Insp Detect Plate

10.3.1 Priority

Must Have

10.3.2 User Story

As a gate inspector, I want license plate numbers to be automatically recognized so that vehicles are logged without manual entry

10.3.3 Preconditions

Vehicle image captured; OCR engine operational

10.3.4 Postconditions

Plate number extracted; cross-referenced with registration database

10.3.5 Test Cases

Id	Description	Weight
INSP-DETECT-TC-011	Recognize Tanzania plate format	High
INSP-DETECT-TC-012	Extract plate number with ≥90% accuracy	High
INSP-DETECT-TC-013	Fallback to manual entry if OCR fails	High
INSP-DETECT-TC-014	Cross-reference with vehicle registration	High

10.4 Ft Insp Detect Trailer

10.4.1 Priority

Should Have

10.4.2 User Story

As a gate inspector, I want trailers to be automatically detected so that I can track additional equipment entering the area

10.4.3 Preconditions

Fine-tuned object detection model deployed; vehicle image captured

10.4.4 Postconditions

Trailer presence flagged; staff alerted for additional verification

10.4.5 Test Cases

Id	Description	Weight
INSP-DETECT-TC-015	Detect trailer with ≥85% accuracy using fine-tuned model	Medium
INSP-DETECT-TC-016	Alert staff when trailer detected	Medium
INSP-DETECT-TC-017	Log trailer separately in vehicle record	Medium

10.5 Ft Insp Cam Adjustable

10.5.1 Priority

Must Have

10.5.2 User Story

As a gate inspector, I want the camera to adjust for vehicles of varied heights so that all vehicles can be properly captured

10.5.3 Preconditions

Adjustable camera mount installed; height range 1.5m to 4m

10.5.4 Postconditions

Camera position adjusted; clear vehicle image captured

10.5.5 Test Cases

Id	Description	Weight
INSP-CAM-TC-001	Capture small car (1.5m height) clearly	High
INSP-CAM-TC-002	Capture safari bus (4m height) clearly	High
INSP-CAM-TC-003	Manual camera adjustment option available	High
INSP-CAM-TC-004	Auto-adjustment based on vehicle detection	Medium

10.6 Ft Insp Cam Angles

10.6.1 Priority

Should Have

10.6.2 User Story

As a gate inspector, I want multiple camera angles of each vehicle so that complete documentation is captured

10.6.3 Preconditions

2-3 cameras installed at gate; cameras synchronized

10.6.4 Postconditions

Front and side images captured; all images archived

10.6.5 Test Cases

Id	Description	Weight
INSP-CAM-TC-005	Capture front view of vehicle	Medium
INSP-CAM-TC-006	Capture side view of vehicle	Medium
INSP-CAM-TC-007	Synchronize capture across all cameras	Medium

10.7 Ft Insp Cam Quality

10.7.1 Priority

Must Have

10.7.2 User Story

As a gate inspector, I want high-quality images in various lighting conditions so that detection accuracy is maintained

10.7.3 Preconditions

HD camera (1080p minimum); auto-exposure configured

10.7.4 Postconditions

Clear image captured; adequate for OCR and object detection

10.7.5 Test Cases

Id	Description	Weight
INSP-CAM-TC-008	Capture 1080p HD images	High
INSP-CAM-TC-009	Auto-exposure adjustment in bright sunlight	High
INSP-CAM-TC-010	Maintain quality in cloudy conditions	Medium
INSP-CAM-TC-011	Weather-resistant housing protects camera	High

10.8 Ft Insp Cam Archive

10.8.1 Priority

Must Have

10.8.2 User Story

As a manager, I want vehicle images archived for audit and dispute resolution so that complete visual records are maintained

10.8.3 Preconditions

NAS storage operational; sufficient storage capacity

10.8.4 Postconditions

Images stored with compression; 30-day retention enforced

10.8.5 Test Cases

Id	Description	Weight
INSP-CAM-TC-012	Archive image to local NAS	High
INSP-CAM-TC-013	Compress images to manage storage space	High
INSP-CAM-TC-014	Enforce 30-day minimum retention	High
INSP-CAM-TC-015	Automatic cleanup of images older than retention period	Medium

10.9 Ft Insp Cred Permit

10.9.1 Priority

Must Have

10.9.2 User Story

As a gate inspector, I want to verify the vehicle matches permit information so that I can detect fraud

10.9.3 Preconditions

Plate number extracted; permit database accessible

10.9.4 Postconditions

Permit verified; mismatch alerted to staff

10.9.5 Test Cases

Id	Description	Weight
INSP-CRED-TC-001	Cross-reference plate with permit database	High
INSP-CRED-TC-002	Alert if plate mismatch with permit	High
INSP-CRED-TC-003	Display permit details on inspection screen	High
INSP-CRED-TC-004	Work offline with locally synced permit data	High

10.10 Ft Insp Cred Driver

10.10.1 Priority

Must Have

10.10.2 User Story

As a gate inspector, I want to verify driver authorization so that only authorized operators are allowed

10.10.3 Preconditions

Driver license presented; verification system accessible

10.10.4 Postconditions

Driver authorization confirmed or denied

10.10.5 Test Cases

Id	Description	Weight
INSP-CRED-TC-005	Verify driver license validity	High
INSP-CRED-TC-006	Verify safari guide license for commercial operators	High
INSP-CRED-TC-007	Manual verification process by staff	High

10.11 Ft Insp Cred Commercial

10.11.1 Priority

Must Have

10.11.2 User Story

As a gate inspector, I want to verify commercial operator licenses for safari vehicles so that regulations are enforced

10.11.3 Preconditions

Operator license database available; vehicle classified as commercial

10.11.4 Postconditions

Commercial license verified; alerts if expired or invalid

10.11.5 Test Cases

Id	Description	Weight
INSP-CRED-TC-008	Check operator license in database	High
INSP-CRED-TC-009	Verify license expiry date	High
INSP-CRED-TC-010	Alert if license expired	High
INSP-CRED-TC-011	Alert if license invalid or not found	High

10.12 Ft Insp Cred Blacklist

10.12.1 Priority

Should Have

10.12.2 User Story

As a security manager, I want to check vehicles against a blacklist so that prohibited vehicles are prevented from entry

10.12.3 Preconditions

Blacklist database maintained; vehicle plate extracted

10.12.4 Postconditions

Blacklist status checked; entry denied if blacklisted

10.12.5 Test Cases

Id	Description	Weight
INSP-CRED-TC-012	Check plate against blacklist database	Medium
INSP-CRED-TC-013	Alert if vehicle blacklisted	High
INSP-CRED-TC-014	Display blacklist reason to staff	Medium
INSP-CRED-TC-015	Check expiry dates for temporary bans	Medium

10.13 Ft Insp Int Logging

10.13.1 Priority

Must Have

10.13.2 User Story

As a gate staff member, I want inspection results to automatically create vehicle log entries so that manual logging is eliminated

10.13.3 Preconditions

Inspection complete; gate operations module accessible

10.13.4 Postconditions

Vehicle log entry created with timestamp, plate, type, and image reference

10.13.5 Test Cases

Id	Description	Weight
INSP-INT-TC-001	Create log entry automatically after inspection	High
INSP-INT-TC-002	Include timestamp, plate, type in log	High
INSP-INT-TC-003	Include image reference in log entry	High
INSP-INT-TC-004	Handle 1000+ log entries per day	High

10.14 Ft Insp Int Permit

10.14.1 Priority

Must Have

10.14.2 User Story

As a gate inspector, I want inspection results linked to permit verification so that complete validation is provided

10.14.3 Preconditions

Inspection complete; permit database accessible

10.14.4 Postconditions

Permit status displayed; inspection result includes permit validity

10.14.5 Test Cases

Id	Description	Weight
INSP-INT-TC-005	Real-time lookup in permit database	High
INSP-INT-TC-006	Display permit status on inspection screen	High

Id	Description	Weight
INSP-INT-TC-007	Link inspection record to permit record	High

10.15 Ft Insp Int Capacity

10.15.1 Priority

Must Have

10.15.2 User Story

As a capacity manager, I want inspection results to update capacity counts so that real-time tracking is maintained

10.15.3 Preconditions

Inspection complete; capacity tracking system operational

10.15.4 Postconditions

Capacity incremented on entry; decremented on exit

10.15.5 Test Cases

Id	Description	Weight
INSP-INT-TC-008	Increment capacity count on vehicle entry	High
INSP-INT-TC-009	Decrement capacity count on vehicle exit	High
INSP-INT-TC-010	Track capacity by vehicle type	Medium

10.16 Ft Insp Ui Dashboard

10.16.1 Priority

Must Have

10.16.2 User Story

As a gate inspector, I want to view a real-time inspection dashboard so that I can monitor and intervene when needed

10.16.3 Preconditions

Inspection system operational; staff logged in

10.16.4 Postconditions

Dashboard displays live feed, detection results, and controls

10.16.5 Test Cases

Id	Description	Weight
INSP-UI-TC-001	Display live camera feed	High
INSP-UI-TC-002	Show detection confidence scores	High
INSP-UI-TC-003	Provide manual override buttons	High
INSP-UI-TC-004	Update dashboard in real-time (<500ms latency)	High

10.17 Ft Insp Ui Override

10.17.1 Priority

Must Have

10.17.2 User Story

As a gate inspector, I want to manually override automatic detection results so that I can correct errors

10.17.3 Preconditions

Inspection result displayed; override access enabled for user role

10.17.4 Postconditions

Manual correction applied; reason documented; audit trail maintained

10.17.5 Test Cases

Id	Description	Weight
INSP-UI-TC-005	Edit vehicle type manually	High
INSP-UI-TC-006	Edit plate number manually	High
INSP-UI-TC-007	Edit trailer status manually	Medium
INSP-UI-TC-008	Require reason for manual override	High
INSP-UI-TC-009	Maintain audit trail of all overrides	High

10.18 Ft Insp Ui Alert

10.18.1 Priority

Must Have

10.18.2 User Story

As a gate inspector, I want to receive visual and audio alerts for credibility issues so that I can take immediate action

10.18.3 Preconditions

Credibility check complete; alert conditions configured

10.18.4 Postconditions

Alert displayed/sounded; staff acknowledged alert

10.18.5 Test Cases

Id	Description	Weight
INSP-UI-TC-010		High

Id	Description	Weight
	Visual alert for permit mismatch	
INSP-UI-TC-011	Visual alert for blacklisted vehicle	High
INSP-UI-TC-012	Visual alert for expired license	High
INSP-UI-TC-013	Audio alert for high-priority issues	Medium
INSP-UI-TC-014	Color-coded urgency levels (red, yellow, green)	Medium

10.19 Ft Insp Ui History

10.19.1 Priority

Should Have

10.19.2 User Story

As a gate inspector, I want to view vehicle inspection history so that I can identify repeat visitors

10.19.3 Preconditions

Historical inspection data available; search interface accessible

10.19.4 Postconditions

Inspection history displayed with images and details

10.19.5 Test Cases

Id	Description	Weight
INSP-UI-TC-015	Search inspection history by plate number	Medium
INSP-UI-TC-016	Search inspection history by date range	Medium
INSP-UI-TC-017	Display all previous inspections with images	Medium

10.20 Ft Insp Manual Entry

10.20.1 Priority

Must Have

10.20.2 User Story

As a gate inspector, I want to manually enter vehicle details when cameras fail so that operations continue

10.20.3 Preconditions

Camera system unavailable; manual entry form accessible

10.20.4 Postconditions

Vehicle details entered manually; marked as manual entry

10.20.5 Test Cases

Id	Description	Weight
INSP-MANUAL-TC-001	Access manual entry form	High
INSP-MANUAL-TC-002	Enter vehicle type, plate, and details manually	High
INSP-MANUAL-TC-003	Tablet-friendly interface for mobile inspection	High
INSP-MANUAL-TC-004	Flag entry as manual for audit purposes	Medium

10.21 Ft Insp Manual Photo

10.21.1 Priority

Should Have

10.21.2 User Story

As a gate inspector, I want to capture vehicle photos using a tablet camera so that visual documentation is maintained when fixed cameras fail

10.21.3 Preconditions

Tablet with camera available; fixed camera system unavailable

10.21.4 Postconditions

Photo captured; uploaded to central archive when network available

10.21.5 Test Cases

Id	Description	Weight
INSP-MANUAL-TC-005	Capture photo using tablet camera	Medium
INSP-MANUAL-TC-006	Upload photo to central archive	Medium
INSP-MANUAL-TC-007	Sync photos when network restored	Medium

10.22 Ft Insp Report Daily

10.22.1 Priority

Should Have

10.22.2 User Story

As a manager, I want to generate daily inspection reports so that I can monitor system performance

10.22.3 Preconditions

Daily inspection data available; reporting module accessible

10.22.4 Postconditions

Report generated with performance metrics

10.22.5 Test Cases

Id	Description	Weight
INSP-REPORT-TC-001	Generate report with total vehicles inspected	Medium
INSP-REPORT-TC-002	Include detection success rate	Medium
INSP-REPORT-TC-003	Include count of manual overrides	Medium
INSP-REPORT-TC-004	Include count of alerts triggered	Medium

10.23 Ft Insp Report Audit

10.23.1 Priority

Must Have

10.23.2 User Story

As an auditor, I want to generate audit reports with all vehicle inspections and images so that compliance is supported

10.23.3 Preconditions

Inspection data and images archived; audit reporting accessible

10.23.4 Postconditions

Comprehensive audit report generated with images

10.23.5 Test Cases

Id	Description	Weight
INSP-REPORT-TC-005	Filter audit report by date range	High
INSP-REPORT-TC-006	Filter audit report by gate	High

Id	Description	Weight
INSP-REPORT-TC-007	Filter audit report by vehicle type	Medium
INSP-REPORT-TC-008	Include vehicle images in report	High
INSP-REPORT-TC-009	Export report to PDF format	High
INSP-REPORT-TC-010	Export report to Excel format	Medium

11 Additional Context

11.1 Success Metrics

11.1.1 Inspection Time

< 30 seconds per vehicle (currently 2-3 minutes manual)

11.1.2 Detection Accuracy

≥ 95% vehicle classification, ≥ 85% trailer detection

11.1.3 Staff Workload Reduction

60% reduction in manual inspection tasks

11.1.4 Automation Rate

90% of vehicles automatically inspected with minimal manual intervention

11.1.5 Audit Trail Completeness

100% of vehicles have image documentation

11.2 Revision Notes

11.2.1 Nov 3 2025

Added adjustable camera requirement for varied vehicle heights, trailer detection with fine-tuned models