Automated Public Transport Service (APTS)

Specification

© West Midlands Combined Authority

Version Control

Version	Date	Description
1.1	17/06/25	Draft for internal review (TfWM / SMBC)
2	30/06/25	Draft for review
2.1	03/07/25	Various amends following first review comments
2.2	07/07/25	Various amends
3	08/07/25	Version for Amey review.
4.1	21/08/25	Initial Amey revisions
4.2	01/09/25	Amey revisions
5	04/09/25	Draft for external consultation
5.1	04/09/25	Working External Draft
5.3	07/10/25	Working External Draft
6	13/10/25	Draft for External Consultation

Document Guidance Notes

I. This Specification document is a resource to support a Tendering or Contracting Authority ("buyer") in the identification, definition and tailoring of requirements relating to the procurement, installation, and operation of a permanent Automated Public Transport Service (APTS). It is therefore designed as a commissioning specification not a technical build specification.

II. This Specification should be considered a constituent part to a tenderers wider procurement documentation when seeking to buy or commission an APTS.

III. Recognising the breadth of solutions future APTS's may take, this document allows for tailoring across multiple parameters by providing a baseline set of requirements relating to elements expected to be consistent across future buyers of services and is in part based upon traditional road-based public transport system procurement requirements and expectations.

IV. Reference is made to the 'Operator' throughout the Specification, who is in effect assumed to be the bidder. The Operator may be a system manufacturer, a transport operator, a hybrid, collaboration, or joint venture, or an as yet undefined body. Whatever the constitution, the requirements of the Specification must be met by the single Operator (bidder). In this regard, *"who does what"* within the fulfilment of the requirements of this Specification is for the market to decide, recognising that future commercial models may differ, and should not be considered of immediate concern to the TA.

V. Following on therefore, it is expected that differing aspects of this Specification will be relevant to differing sectors and specialisms (i.e., vehicle manufacturers, AV developers, traditional transport operators, etc.). It is for each individual organisation to understand and identify how they would meet the output requirements within this Specification, and what role their product or service would play in meeting the stated requirements in a future tender.

VI. This Specification is released for review ahead of the publishing of the UK Automated Passenger Service (APS) Permitting guidance, and regulatory / legislative requirements contained within this document may therefore be subject to significant revision.

VII. Feedback on all aspects of this document is warmly invited up to 12/12/25. Please address all comments and queries to innovation@tfwm.org.uk

Document Usage

To use this Specification, Tendering Authorities (TA's) should insert their tender specific information into the highlighted boxes throughout this document. The highlighted texts illustrate a selection of the typical values expected. Where necessary remove non-applicable text / sections.

Specification Contents

1. Introduction

1.1. Glossary of Terms

The following acronyms and abbreviations are used within this Specification document.

Abbv	Definition
ADAS	Advanced Driver Assistance Systems
ADS	Automated Driving System
API	Application Programming Interface - An interface for integration with other software apps and tools.
APTS	Automated Public Transport Service - A service designed to provide public transport to using automated vehicles.
ASDE	Authorised Self-Driving Entity - The manufacturer or technology company responsible for putting forward an AV for authorisation, as defined by the Automated Vehicles Act 2024.
ASILs	Automotive Safety Integrity Levels - Levels used in ISO 26262 to classify the risk of a system, with ASIL D being the highest.
AVs	Automated Vehicles - Vehicles capable of driving themselves without being controlled or monitored by an individual (SAE Level 4).
CAM	Connected and Automated Mobility - Refers to the industry supporting the safe deployment of automated vehicles.
CCTV	Closed-Circuit Television - On-board equipment requirement.
DDA	Disability Discrimination Act - Relevant accessibility standard.
DfT	Department for Transport
DRT	Demand-Responsive Transport - A public transport service that operates flexible routes and schedules based on passenger demand, often booked via an app.
DVSA	Driver and Vehicle Standards Agency
E/E	Electrical and Electronic - Refers to the electrical and electronic systems of the vehicle.
EMV	Europay, MasterCard, and Visa - Refers to payment standards for contactless cards.
GDPR	General Data Protection Regulation - Data protection legislation compliance requirement.
GIS	Geographic Information System - Used for precise route mapping.
HIL	Hardware-in-the-Loop - Testing performed to verify hardware and software interaction.
HMI	Human-Machine Interface - A system interface provided to passengers.
KPIs	Key Performance Indicators - Metrics used for performance monitoring and evaluation.
MRM	Minimum Risk Manoeuvre - A predefined, automated response by the vehicle to reach a safe state in the event of system failure or an unresolvable hazardous situation.
NUiC	No User in Charge - A NUiC journey refers to a fully automated vehicle trip in which no human is present to control the vehicle, and the operation is overseen remotely by a licensed no-user-in-charge operator, as defined under the UK's Automated Vehicles Act 2024
ODD	Operational Design Domain - The specific conditions under which an automated driving system is designed to function safely, including environmental, geographical, and operational constraints.
OTA	Over-the-Air - Mechanisms for software updates.
PSVAR	Public Service Vehicles Accessibility Regulations - Regulations from 2000 regarding accessibility standards for vehicles.
RTK	Real-Time Kinematic - A service for digital infrastructure.
RTPI	Real Time Passenger Information
SIL	Software-in-the-Loop - Testing performed to verify hardware and software interaction.

SLA	Service Level Agreement - agreement between the Operator and the TA that outlines the expected service levels and standards for the specified period.
SOTIF	Safety of the Intended Functionality – ISO 21448 - addresses risks arising from unknown and unforeseen scenarios, limitations of sensors, and interaction with the ODD that are not directly covered by functional safety.
TA	Tendering Authority. This may be a public or private body.
TOD	Target Operational Domain
TUPE	Transfer of Undertakings (Protection of Employment) Regulations 2006 - Regulations regarding potential transfer of existing staff.
ULEZ	Ultra Low Emission Zone - Refers to emission standards requirements.
VCA	Vehicle Certification Agency - UK authority for safety case acceptance as part of type approval and authorisation processs..
VRU	Vulnerable Road User - Includes pedestrians, cyclists, motorcyclists, and children.

1.2. Service Summary

This table provides an outline summary of key details relating to this Service.

Parameter	Expected Service Values
Tendering Authority (TA)	[Name of Tendering Organisation]
Tendering Authority Type	[Local Authority | Transport Authority | Port Authority | Other]
Tender Type	[Open | Restricted | Selective | Negotiated]
Contract Duration	[Minimum X Year Term, Extension]
Target Service Start	[20XX]
Project Type	[New | Extension]
Vehicle Type	[Private Occupancy | Shared Occupancy]
Land Ownership of Route	[Private | Public | Mix]
Service Hours	[Day time | 0600 – 2000 | 24 hrs]
Service Route	[Fixed | Roaming]
Route Distance / Service Area	[XX]
Fare Paying	[Yes | No | TBA]
Service Type	[Scheduled | Demand Responsive]
Service Registration	[Registered | Unregistered]
Peak Expected Demand	[XXXX ppdph]
Vehicle Capacity	[>= X passengers per vehicle]
Vehicle Number	[XX]
Max. Service Speed	[15 mph | 30 mph | 60 mph]
Traffic Segregation	[Segregated | Unsegregated | Limited Segregation]
Path	[At Grade | Part-Elevated | Elevated]
Vehicle Fuel Type	[Electric | Euro VI | Other (Define)]

Automated Public Transport Service Specification. V6.

1.3. Purpose

Public transport in the UK is crucial for economic growth, social equity, and environmental sustainability. It provides access to jobs, education, and services and helps reduce the congestion and pollution related to private car use. Reliable, accessible, sustainable, resilient and affordable public transport is essential for continued economic, social and health development.

Automated transport has for many years promised to offer a step change to mobility. Within the context of public transport, the ambition is to be able to reduce operational costs whilst maintaining, if not increasing, fare box receipts. In turn, this reduction in operational cost can be re-invested in addressing the well understood reasons why many citizens do not use existing bus services: frequency; density; reliability; safety, and / or used to offer new routes that would not traditionally be considered commercially viable due to lower patronage.

The bar relating to the delivery of public transport services is high, in large part because communities will rely on them. Intermittent, unreliable or unconsciously discriminatory services would very quickly undermine trust, value and adoption – making them impossible to invest in.

This Specification relates to the procurement of an Automated Public Transport Service (APTS) that will become an exemplar in how to harness automated technology to deliver real, lasting public benefit.

1.4. Target Outcomes

The APTS will support the Tendering Authority in achieving their strategic aims and must therefore provide a high level of confidence that the required outcomes will be met once the service has moved into operation.

The installed APTS should target:

- Enhanced public safety, and perceptions of safety, by reducing incidents / accidents and creating a **safer** public transport network.
- Creating a **more reliable** network, and where applicable delivering reduced air and noise pollution, as well as lowering carbon emissions.
- Encouraging travel behaviour change and increased use of sustainable transport modes through the delivery of **convenient, flexible,** services.
- Being open and available to all by being **affordable**, **accessible** and **desirable**.
- [Additional Target Outcomes as required]

1.5. Required Outputs

This Specification document provides a detailed description of requirements for the APTS. At a high-level, certain outputs should be met.

The installed APTS should:

- Install and operate a passenger carrying service for [Free to use | Fare paying] passengers on a [fixed, defined | To Be Agreed] route.
- Operate at a minimum 'Society of Automotive Engineers' (SAE) Level 4 autonomy.

- Have no ongoing requirement for an on-board driver / Safety Operator.
    - *Accepting that there may also be an initial need for some operational or customer assistance staff on board for an agreed period.*
- Integrate with existing public transport infrastructure, policies, processes and software platforms as identified through the tender process.
- [<mark>Additional Target Outcomes as required</mark>]

1.6. Service Responsibilities

To provide clarity around who will assume responsibility for the various aspects of a future APTS, the table below serves to provide guidance in relation to this Service Specification.

	Activity	TA	Op
1	Determine the route	X	
2	Specify the frequency	X	
3	Set and monitor quality and service safety standards	X	
4	Set vehicle capacities and minimum standards	X	
5	Develop a set of acceptable and agreed SLA's and KPI's	X	
6	Agree the route schedule prepared by the Operator	X	
7	Set fares and retain the revenue	X	
8	Supply and maintain ticket machines	X	
9	Supply and maintain radio and vehicle tracking equipment	X	
10	Provide and maintain APTS network infrastructure (stops, stands and stations, lighting, off-vehicle intercoms)	X	
11	Ensure presence of road markings and signage	X	
12	Provide an emergency communication facility (Network Management Control Centre) [During Service Hours | 24/7]	X	
13	Manage liaison with local authorities and other stakeholders	X	
14	Coordinate public customer service contacts – complaints, comments and compliments	X	
15	Invest in major network and infrastructure projects (inc. bus priority and kerbside / lane management / apportionment)	X	
16	Maintain the road surfaces and on-route vegetation	X	
17	Registration of the service and RTPI requirements as required	X	
18	Market the APTS services to the public	X	X
19	Provide roadside staff to deal with diversions and major incidents 24 / 7	X	X
20	Adhere to UK Data Protection, Privacy and GDPR regulation	X	X
21	Maintain emergency communication / OOH contact facilities	X	X
22	Provide and maintain all aspect of fleet and management thereof, inc. recovery		X
22	Develop timetables, schedules and staff rotas – schedules must be agreed with the TA		X
23	Ensure revenue protection		X
24	Deliver a service and reports measured against the SLA's and KPI's		X
25	Provide and maintain premises and vehicles		X
26	Provide digital communication network as required by solution		X
27	Recruit, train and manage sufficient staff of a suitable calibre		X
28	Manage the day-to-day operation of routes		X
29	Provide day to day supervision of routes, to maintain quality and deal with disruption		X
30	Control the use of passes on APTS		X
31	Comply with UK statutory and regulatory regimes, including Operating Licenses		X
32	Provide service-specific on-route CCTV where required		X
33	Provide data that is reasonably required by the TA		X

[Delete / Edit as desired]

1.7. Specification Structure

This Specification divides an APTS into six Components, forming the structure of the document. This section provides a high-level overview of the structure, with each Component being subject to its own subsequent individual section.
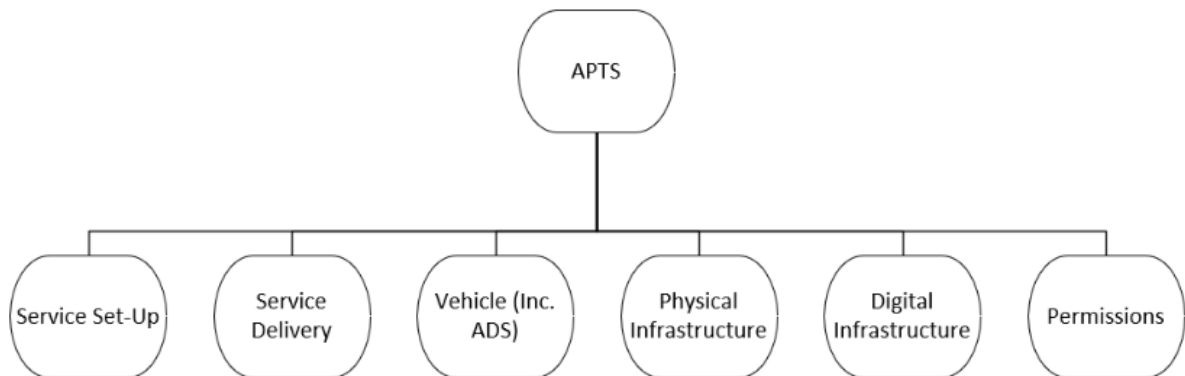
1. **Service Set-up:** The service that should be provided to the passengers. This includes aspects such as the timetable, the Operational Design Domain (ODD), integration into existing public transport systems and the plans and processes that should be in place before the service starts.

2. **Service Delivery:** The on-going delivery of the service. This includes aspects such as reporting, cleaning, maintenance and customer support.

3. **Vehicle (inc. Automated Driving System)**: The physical vehicle capability and construction. This includes aspects such as the required autonomy level, the autonomous driving software, systems for on-board passenger information and communications.

4. **Physical infrastructure**: The physical infrastructure necessary to operate the APTS. The physical infrastructure includes: road, stops (including a communication system at the stops if necessary), turn areas, depot, control centre and vehicle charging facility.

5. **Digital infrastructure and Non-ADS Software**: The digital infrastructure necessary for operating the APTS. This includes: 4G/5G mobile network, wired & wireless infrastructure , RTK service, Digital Traffic Regulation Order (TRO), customer information / booking platforms and data collection.

6. **Permissions**: Any permissions being necessary to operate the service on a dedicated route.

2. Service Set-Up

The Service Set-up Component details the Service to be delivered and what it should provide to the passengers who will use it.

2.1. Route and Stops

- The service [route | area] is provided at

- Appendix B: Tender [Route | Area].
- The service will operate along the following routes.
  - Route 1: Between [Location] and [Location].
  - Add as required
- The route includes the following significant trip attractors:

[Example attractors text supplied – edit/delete as appropriate]

Attractors	Qty	Location / Link	Attractor Notes
Supermarket			
Hospital			
Schools			
Airport			
Town/Village Centre			
University / College			
Other Attractor [define]			

- Future planned / forecast development along the route (impacting demand and / or journey times during development phase) includes:

[Example of Future Development text supplied – edit/delete as appropriate]

Future Development	Qty	Location / Link	Development Outline	Expected size and service impact
Supermarket				
Hospital				
Schools				
Business Park				
Housing Estate				
University / College				
Other Developments [define]				

- Route 1 is expected to consist of [XX] stops, allowing for on and off-boarding of passengers. These stops (including route start and end) are:

[Example Route table with text supplied – edit/delete, add tables, as appropriate]

[Route Name]	Location Name, description	Link
Start point	Place name, additional location identifier	See map in appendix [A]
Stop 1	Place name, additional location identifier	See map in appendix [A]
Stop 2	Place name, additional location identifier	See map in appendix [A]
Stop 3	Place name, additional location identifier	See map in appendix [A]
Stop N	Add additional rows as required	See map in appendix [A]
Termination point	Place name, additional location identifier	See map in appendix [A]

2.2. Target Operational Domain (TOD)

- The Target Operational Domain is the set of operating conditions in which an ADS will be expected to operate, including, but not limited to, environmental, geographical, and time-of-day restrictions, and-or the requisite presence or absence of certain traffic or roadway characteristics

- The system will be expected to operate, and capable of dynamically ensuring it remains within, the high-level TOD parameters provided at Appendix C: Target Operational Domain.

2.3. Users

- The service will be [restricted (only accessible to certain groups i.e. employees of XXXX) | unrestricted (open to the general public)] access.
- This service is envisaged to be primarily considered a [commuter | rural | On-campus | mixed | other] service.

2.4. Passenger Volumes, Timetable and Operating Hours

- It is expected that the service will transport [XXX] people per hour per direction (pphpd) at peak demand, with a maximum interval of [XXX] minutes, and [must | should | is not expected to] have the capability to expand to meet future demand.
- Individual AVs are therefore expected to have capacity for approximately [8 | 16 | 29 | 35 | 49 | 63 | 87] passengers.
- The APTS shall operate along the agreed routes and according to the pre-defined and agreed schedule as provided in Appendix D: Service Timetable
- The Operator should allow for the provision of real-time adjustments based on demand, traffic conditions, or other opportunities to improve service provision that may occur.

2.5. Diversions / Service Flexibility

- The APTS must be capable of responding to short term road blockages and closures etc. by way of pre-agreed diversions that conform to the service Safety Case and the designed ODD.

2.6. Contingency / Continuity planning

- The Operator must ensure contingency plans are in the place to ensure the continued delivery of a service (e.g. manually driven service) if, for any reason, the APTS system is not capable of operating for any period post go-live due to, for example, conditions outside of the agreed ODD; technical disruption; planned / ad hoc maintenance.
- This contingency must be tested on a [quarterly | annual | bi-annual] basis.
- Completion reports will be required that illustrate the outputs from contingency and continuity testing, demonstrating ongoing progress against SLA's and KPI's.

2.7. Incident Response Plan

- A comprehensive incident response plan shall be developed and regularly tested, covering:

  o Emergency procedures for accidents, incidents, breakdowns, or IT and cybersecurity incidents.
  o Protocols for communicating with emergency services and authorities.
  o Data logging and preservation for accident investigation.
  o Public and project communication strategies.
  o Cooperating with an independent incident investigation function (AV Act 2025)

- Emergency Protocols: Clear emergency protocols shall be established for handling accidents, service disruptions, and other unforeseen events.

2.8. Registering the Service

- Where the service utilises Public Service Vehicles (PSV), the Operator will be responsible for registering the service with the Traffic Commissioner in accordance with the guidance arising from the AV Act 2024.
- Guidance on Public Transport operations is provided at Appendix E: Guidance on delivering Public Transport services**.**
- Note that this is not a bus service in the traditional sense it is an APTS under the definitions in the AV Act 2024 but the guidance for Public Transport Services should be followed.

2.9. Ticketing and Fare Structure

- The service [requires | does not require | must be adaptable to provide] an [end user | corporate] fare paying solution.
- The [operator | TA] will set the fares
- Fare integration e.g., participation in multi-operator ticketing schemes [is | is not] required
- Specific ticket types e.g., concessionary passes [will | will not] be accepted
- Options (if any) for those without smartphone access or indeed the unbanked.

2.10.   Payment System

Where the service includes fare paying requirements the following requirements will apply:

- The ticketing strategy will be to [Buy-before-you-board | Buy onboard | APTS stop totems |Passes | Mixture of all ticket purchase methods].
- The APTS [shall | may seek to] integrate with relevant transport smartcards such as [Name(s)]; using barcodes and contactless EMV payments supporting various payment methods (e.g., mobile payments, smart cards, credit/debit cards).
- Provide solutions which ensure that as far as is reasonably practicable, make fare evasion and / or avoidance, 'difficult by design'.
- Payment systems will utilise industry standard software protocols with safety, usability and security built in by design.

2.11.   Off-Board Customer Support (*where Operator is lead*)

- A dedicated customer support service shall be in place to assist passengers with operational enquiries, complaints, and lost items.
- Customer support should be accessible by phone, social media platforms and email and should be available during service hours.
- An emergency contact number should be staffed and available during [service operating hours | extended operating hours | office hours | 24/7].

2.12.   Off-Board Customer Support (*where TA is lead*)

- The Operator will have a nominated Customer Support lead to liaise with the TA's Customer Support team.
- Customer Support will be available during [operating hours | extended operating hours | office hours | 24/7].

2.13.   Passenger Information

Passenger Information requirement	Options	Required Y/N
Off Vehicle Information	• Timetable displays at stops • Online information • Mobile App	• [Yes/No] • [Yes/No] • [Yes/No]
Real-time data requirements	• Available as Open Data – API's	• [Yes/No]
Real-time Information [Passenger App | Onboard Display]	• Vehicle location • Arrival time • Disruptions	• [Yes/No] • [Yes/No] • [Yes/No]
Provision of Bus Open Data Service (BODS)	• Timetable data • Fares data • Vehicle location (real-time) data • Performance (punctuality) data.	• [Yes/No] • [Yes/No] • [Yes/No] • [Yes/No]

2.14.   Staffing Requirements

- A thorough and detailed assessment will be required to ensure that sufficient trained and experienced staff are available to fulfil the roles required to run the service safely and to the required standards.
- The key roles required to run an APTS may be interchangeable and could include:
  - Safety Operator (Drivers and Support)
  - Second Officer (Junior operators)
  - Bankspeople
  - Vehicle Service, inspection and support
  - Remote Operations support staff
  - All reporting, HR and service delivery roles
  - IT and cyber-security support staff
  - Leadership and Management
- Thorough ongoing record keeping will be required to support the service delivery. Training, qualifications, accreditations, working hours etc. will all need to be maintained and reported on as described through the Tender requirements.
- handling accidents, incidents, service disruptions, and other unforeseen events.

2.15.   Ability to run a Public Transport service

- Tenderers are required to demonstrate their ability to manage APTS services in the detailed service environment and are expected to have familiarised themselves with the operating conditions, contractual requirements and regulatory and statutory framework applicable to the TA's bus network(s) in sufficient detail to complete the Tender documents to a high standard.

Automated Public Transport Service Specification. V6.

- In particular, Tenderers should fully familiarise themselves with the variable operating conditions on the route for which a Tender is being submitted so that the Tender will satisfy the necessary bodies that all the quality requirements specified can be met.
- Ensure compliance with Regulation (EU) No 181/2011 (as retained in UK law) establishes rules for bus and coach transport in respect of:

  - Non-discrimination between passengers with regard to transport conditions offered by carriers
  - Rights of passengers in the event of accidents arising from the use of the bus or coach, resulting in death or personal injury or loss or damage to luggage
  - Non-discrimination and mandatory assistance for disabled persons and persons with reduced mobility
  - Rights of passengers in cases of cancellation or delay
  - The minimum information to be provided to passengers

2.16.   Inclusivity

- Services must ensure, as far as is reasonably practicable, that no demographic is dissuaded from using the APTS. This [will | may] include committing to on-going engagement with a Customer Panel.
- The service must create and maintain a "perception of safety", as far as is reasonably practicable - definition and process to be agreed with the TA.
- Operators must demonstrate an ability to pro-actively safeguard those with protected characteristics, as defined within the Equalities Act (2010). This is during engagement, operations and in the event of emergencies. Protected characteristics are:
  - Age
  - Disability
  - Gender re-assignment
  - Marriage and Civil Partnership
  - Pregnancy and Maternity
  - Race
  - Religion or Belief
  - Sex
  - Sexual Orientation

2.17.   Service Compliance

There is recognition that the forthcoming Automated Vehicles Act 2024 Secondary Legislation may impact upon the appropriateness of some of the below and that content and requirements can change as new laws and guidance are introduced.

- The service must seek to comply with the following (or equivalent) standards, or demonstrate equivalent procedures and best practises:
  - Health and Safety at Work etc. Act 1974
  - Public Passenger Vehicles Act 1981
  - The Road Traffic Regulation Act 1984
  - Transport Act 1985 and 2000
  - Public Service Vehicles (Registration of Local Services) Regulations 1986
  - Road Traffic Act 1988

- o The Public Service Vehicles (Operators' Licences) Regulations 1995
- o Disability Discrimination Act 1995
- o The Public Service Vehicles Accessibility Regulations 2000
- o The Equality Act 2010
- o Road Transport Operator Regulations (2011)
- o Bus Services Act (2017) – *if vehicles are over 22 seats*
- o Public Service Vehicle (Accessible Information) Regulations 2023
- o Automated Vehicles Act (2024)
- o Highways Code (2025)
- o BSI Flex 1886 through to BSI Flex 1891
- o BSI PAS 1880 through to BSI PAS 1885
- o PAS 11281 | PAS 29000
- o All Traffic Regulation Orders (TRO) on route
- o Any future requirements as laid out in the Bus Services Bill (No. 2)
- o Regulation (EU) No 181/2011
- o Any TA-specific Passenger Charter / Service Standard
- o Accreditation from any independent charity / organisation where available / appropriate

- Compliance with standards will need to be maintained and reaccreditation undertaken as / when required by the relevant standards body

3. Service Operations

Once the service has become established, the following requirements will be central to the on-going successful delivery of the passenger service.

3.1. Cleaning

- Vehicles will need to be cleaned externally before or after each operating day and the interior of the service should be maintained in a clean and hygienic state.

3.2. Maintenance / checks

- All aspects of the APTS will be subject to maintenance and check regimes in line with manufacturers recommendations as a minimum. Regimes will be shared with the TA, with records kept of completion, accessible to the TA upon request.

3.3. Marketing and Promotion

- [insert any requirements within local Enhanced Bus Partnership Agreements]
- Strategies shall be in place to educate the public about the service, its capabilities, and limitations, fostering trust and understanding. Special consideration should be given to vulnerable individuals.
- Compliance with protected marketing terms that are expected to come forward in secondary legislation (Automated Vehicles Act 2024).

3.4. Public Communication

- Ongoing communication with the public about the service, it's performance, safety record, and any changes to the service operation.
- Attendance at public engagement / promotional events as requested by the TA

3.5. Fare Collection and Protection

- Allow free, unhindered, access to TA fare / revenue protection staff
- Work collaboratively with the TA to optimise receipts

3.6. Accident, Incident, Near Miss Response

- A physical response (i.e. a human representative from the Operators organisation or an approved and elected third party arriving at a vehicle) must be capable of being made within [XX] minutes of a remote, on-board alert being raised.

3.7. Accident, Incident, Near Miss Reporting

- A robust system for reporting, investigating, and learning from all accidents, incidents and near misses, however minor, shall be in place. This includes sharing relevant data with the TA and appropriate regulatory bodies.
- The definition of 'near miss' shall be agreed between TA and Operator as part of contract mobilisation

3.8. Remote Supervision, Assistance and Intervention

- When operating with no on-board supervision, a robust remote supervision system shall be in place to:

  o Monitor vehicle performance and environmental conditions.

- Provide assistance or intervention when the AV encounters situations outside its ODD or beyond its self-driving capabilities.
- Ensure rapid response and communication with passengers and / or emergency services if required.
- Systems in place to record all aspects of supervision, assistance and intervention, with data provided to the TA upon request.

3.9. Co-Location

- There [Will | May | Will not] be a requirement for co-location of [some | all] the APTS employees at the TA's operational premises

3.10.   Ongoing Monitoring and Performance Tracking

- The Operator shall continuously monitor the performance of the automated vehicles in service, tracking safety-critical events, interventions, and overall system reliability.

3.11.   Service Data Recording and Provision

- The Operator shall continuously monitor the performance of the automated vehicles in service, tracking safety-critical events, interventions, and overall system reliability.
- The vehicle shall continuously record internal and external video footage. This data will be used for continuous improvement of the service and investigation of allegation, near miss, incident or accident on-board or external to the vehicle.
- Vehicle data will be held centrally and data relating to road condition, traffic volumes, lines and signs, road condition will be the property of the TA.
- Service-related data to be collected and shared with the TA will be part of the agreed SLA and KPI's which will include at least:
    - Number of registered riders
    - % of vehicle downtime / off the road
    - Number of hours of operation
    - Demographic split of ridership

3.12.   Service Panel

- The Operator [is expected to | may be required to] partake in an APTS Service Panel. The Service Panel will have representatives from the TA, Local Authorities, emergency services and customer / user representation.
- The Service Panel will meet [monthly, quarterly, annually] to review service performance; agree any changes to service provision; identify opportunities for continuous improvement

4. Vehicle and Automated Driving System (ADS)

The vehicle operated within the service will play a central role in providing an optimal customer experience. This section details the requirements relating to the vehicle capability and construction.

4.1. Vehicle

- *The vehicle used must conform to the following requirements*

Vehicle Requirement			
Capacity Seated	Min Capacity seated:	Max Capacity Seated:	
Capacity Total	Min Total Capacity:	Max Total Capacity:	
Vehicle Type	Single Decker	Double decker	Single or Double
Emissions	Euro VI compliant	Electric	Other: (Describe)
Vehicle Age	Maximum Acceptable age:		
Livery	LA branding	Operator branding	Bespoke branding
Seating configuration	Forward Facing	Rear / side facing	[Mixed] or [NA] Other: (Describe)
Accessibility	Public Service Vehicles Accessibility Regulations 2000 Compliant		

Table…

4.2. Vehicle System Safety

- The vehicle used must gain type approval under one of the approval processes (whole vehicle, small series, individual vehicle, etc.) administered by VCA or an equivalent body. As part of the approval assessment, the manufacturer or ASDE must expect to present their safety management system (using e.g. ISO 26262, ISO 21448, etc.), their verification approach credibility, and their safety case evidence.
- The vehicle used must gain authorisation for the intended location, including backup routes for e.g. road closures, according to the forthcoming authorisation assessment processes administered by VCA or an equivalent body. As part of the authorisation assessment, the ASDE and NUiC operator must expect to present their operating plans, including ensuring roadworthiness on an ongoing basis, and responding to ODD departures and incidents.
- The regulations for type approval and assurance are evolving, and it can be expected that these will be regularly updated while the sector experience grows. It will be the responsibility of the NUiC operator to ensure that the vehicle used will remain compliant with type approval and authorisation requirements on an ongoing basis.

4.3. On-board Human Machine Interface (HMI)

- A clear and intuitive HMI shall be provided to passengers, enabling them to:
  - Request a stop.
  - Understand the vehicle's operational status.
  - Initiate emergency stops.
  - Communicate with remote support and receive near-instant audio and visual responses. Communication channels available should consider the need for reporting and raising an alarm or a concern anonymously.
  - View route maps and vehicle location.

- o Provide planned visual and audio announcements, inc. next stop and diversion, including through an induction hearing loop at every wheelchair space and priority seats.
- o Receive real-time service information.
- o A display showing onward connection details by APTS or bus (including designated feeder services), train, Metro or air, where applicable, from open data sources.

4.4. Passenger Management
- The vehicle / system will:
  - o Be capable of counting passengers on and off the vehicle and reporting this information digitally.
  - o Ensure vehicle weight or passenger maximums are not exceeded at any point.
  - o Pro-actively monitor passenger behaviour to ensure alerts go to control centres of any anti-social behaviour, medical emergency, or other unexpected passenger event.
  - o Sense, and respond appropriately to, trapped articles in doors.
  - o Proactively identify left-luggage / suspicious packages.
  - o Be able to recognise and prevent people boarding dependent upon what their behaviour and / or what they are carrying.
  - o Be able to ensure passengers are ready (e.g. safely sat / wheelchairs appropriately anchored) before departure.
  - o Recognise when it is not appropriate to stop at a stop or location if there is a safety issue (e.g. fire, fight, over-crowding).
  - o Be capable of managing a safe evacuation of passengers.

4.5. Passenger Services
- The vehicle will be expected to provide the following:
  - o [USB charging]
  - o [Wi-fi]
  - o [5G connectivity]
  - o [Seatbelts]
  - o [Heating and cooling for customer comfort]
    - o [Hand straps or equivalent]
    - o [Easily accessed storage solutions for large bags / luggage]

4.6. Vehicle Data Recording and Provision
- The vehicle will be equipped with internal and external video cameras, operating at all times the vehicle is powered on.
- The vehicle shall continuously record critical data related to its operation, including:
  - o Sensor data, vehicle state, system decisions, vehicle telemetry data, video footage (internal and external) and data relating to any on-board or remote interventions.
- This data will be used for core performance reporting, continuous improvement of the service and / or investigation of allegation, near miss, incident or accident on-board or external to the vehicle.

- Vehicle data to be collected and shared will be able to provide, as a minimum:
  - Video footage, ADS system data and any other agreed data captures - at any given time within the previous [28] days of operation.

4.7. Vehicle Updates and Maintenance

- Critical vehicle components should be available within a defined, pre-agreed and acceptable timeframe to ensure minimised time off road.
- The TA will be informed and allowed to comment on any new or changed vehicle hardware considered important to either safety or customer experience.

4.8. Software Updates and System Maintenance (ADS)

- The NUiC operator must ensure that vehicle behaviour as a result of software updates and system maintenance (or lack of) remains compliant with type approval and authorisation requirements on an ongoing basis.

- Detail of any changes to ADS and / or any material and relevant part of any remote monitoring control centre software will be shared with the TA ahead of any change and subject to appropriate Change Control processes that will be defined.

- All ADS and / or any material and relevant part of any remote monitoring control centre software updates, patches, and maintenance activities shall be subject to appropriate planning, testing and scheduling to minimise risk of impact to service delivery.

4.9. Vehicle and ADS Compliance

There is recognition that the forthcoming AV Act 2024 legislation and guidance may impact upon the appropriateness of some of the below.

- The vehicle used, including ADS, must gain type approval and authorisation. The following standards are provided for indicative guidance only. This list is not comprehensive:
  - The Road Vehicles Construction and Use Regulations 1986
  - The Road Vehicles Lighting Regulations 1989
  - GB Type Approval Scheme
  - Automated and Electric Vehicles Act 2018
  - Public Passenger Vehicles Act 1981
  - The Public Service Vehicles Accessibility Regulations 2000
  - The Road Vehicles (Authorised Weight) Regulations 1998
  - ISO 26262:2018 Road Vehicles - Functional Safety, parts 1 – 12
  - ISO 21448:2022 Road vehicles — Safety of the intended functionality
  - ISO 22737 Low Speed Automated Driving (LSAD) systems for predefined routes (where applicable)
  - ISO 34503:2023 Road Vehicles — Test scenarios for automated driving systems — Specification for operational design domain
  - UL4600 Ed. 2-2022 Standard for Evaluation of Autonomous Products
  - BSI PAS 1881 Assuring the operational safety of automated vehicles – Specification

- o BSI PAS 1882 Data collection and management for automated vehicle trials for the purpose of incident investigation – Specification
- o BS 8611 (Robots and Robotic Devices - Guide to the Ethical Design and Application of Robots and Robotic Systems): While primarily ethical, this standard provides a framework for considering broader societal impacts and can inform safety design.
- o SAE J3016 (Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles): Used for clearly defining the level of driving automation.
- o Compliance with any Vehicle related aspects of an areas Enhanced Partnership bus scheme.

- • Compliance with standards must be maintained and reaccreditation undertaken as and when required by the relevant standards body.

5. Physical Infrastructure

Any public transport system will include requirements for physical infrastructure to support delivery. It is envisaged that any Operator will be responsible for the specification and establishment of their requirements, however this section provides guidance on minimum expectations.

5.1. Depot
- A suitable safe and secure location should be provided for a depot, in the near vicinity of the route / service area to minimise "dead" miles travelling to the route / service area.
- Facilities should be in place to ensure maintenance and cleaning of vehicles can be completed efficiently and effectively.
- Provide adequate charging infrastructure for vehicle fleet.
- The depot and operations therein will comply with all aspects of relevant H&S legislation

5.2. Charging Stations
- Charging stations [must | should] be strategically located to support and optimise the operation of electric AV's.
- Where desirable or required the TA will collaboratively explore Opportunity Charging options along the route.

5.3. Control Centre
- A control centre shall be established to monitor and manage the APTS in real-time. This [will | may | may not] be at the same location as the APTS depot.

5.4. Roadside infrastructure
- Any APTS-specific roadside infrastructure required by the Operator to facilitate the effective operation of their system must be detailed by the Tenderer to the TA and will, where necessary be subject to Planning Permission and / or any other existing regulations relating to the design, construction, installation and operation of the infrastructure.
- Maintenance, cleaning and general upkeep of roadside infrastructure will be the responsibility of the tenderer.

5.5. Purpose built roadway (inc. Bus Gates; Guideway; Elevated Sections)
- Expected to be responsibility of [TA | Operator | Joint provision]
- [Detail any requirements if to be responsibility of Operator]

5.6. Waiting Shelters
- Expected to be responsibility of [TA | Operator | Joint provision]
- [Detail any requirements if to be responsibility of Operator]

5.7. Payment / ticket terminals
- Expected to be responsibility of [TA | Operator | Joint provision]
- [Detail any requirements if to be responsibility of Operator]

5.8. On Route signage
- Expected to be responsibility of [TA | Operator | Joint provision]
- [Detail any requirements if to be responsibility of Operator]

5.9. Road, vegetation and line maintenance
- Expected to be responsibility of [TA | Operator | Joint provision]
- [Detail any requirements if to be responsibility of Operator]

5.10.　Roadside signals
- Expected to be responsibility of [TA | Operator | Joint provision]
- [Detail any requirements if to be responsibility of Operator]

5.11.　Physical Infrastructure Compliance
- Depot: [Relevant standards]
- Charging: [Relevant standards]
- Control Centre: [Relevant standards]
- Roadside Infrastructure: [Relevant standards]
- Purpose Built Roadway: [Relevant standards]
- Waiting Shelters: [Relevant standards]
- Payment / ticket terminals: [Relevant standards]
- On Route signage: [Relevant standards]
- Road, vegetation and line maintenance: [Relevant standards]
- Roadside signals: [Relevant standards]

- Compliance with standards must be maintained and reaccreditation undertaken as and when required by the relevant standards body

6. Digital Infrastructure and Non-ADS Software

Digital infrastructure and non-ADS software is expected to be a critical component of any successful APTS. This section details the TA's minimum expected requirements.

6.1. Communication Network

- Provide and/or ensure a reliable communication network is in place to robustly and reliably connect AVs, infrastructure and the APTS control centre as required by the Operators system solution.

6.2. Cybersecurity and Data Protection

- Cybersecurity (ISO/SAE 21434): Robust cybersecurity measures shall be implemented to protect the vehicle's systems from unauthorised access, manipulation, and cyber-attacks throughout its lifecycle. This includes:
  - Threat analysis and risk assessment.
  - Secure software development and integration.
  - Protection against remote and physical attacks.
  - Ongoing monitoring and vulnerability management.
- Cybersecurity: Robust cybersecurity measures shall be implemented to protect against cyberattacks and ensure the safety of the system.
- Data Protection Requirements: Compliance with GDPR and other relevant data protection legislation.
- GDPR: Operators will need to be registered with the Information Commissioners Office as Data Controllers and demonstrate compliance with the six principles of the Data Protection Act 2018 (General Data Protection Regulation).
- Security: The system shall be secure against physical and cyber threats, protecting passengers, infrastructure, and data and in particular dealing with anti-social behaviour.

6.3. Software Platform and Interfaces

- Fleet Management: The software platform [May |Shall | Will] be required to manage the fleet of AVs, including dispatching, routing (where required), charging, and maintenance.
- Traffic Integration: Where the TA's systems allow, the Tenderers platform shall integrate with existing traffic management systems to optimize traffic flow and minimize congestion.
- Data Analytics: The platform shall collect and analyse data on system performance, passenger usage, and traffic patterns to improve service efficiency and inform future planning.
- Customer interface: Provision of a Rider App and API (or service).
- Supervision: Dispatch engine operating the system, remote control app and/or interface and autonomous control service and safety monitoring.
- Interface for integration into agreed journey planners
- Journey booking and fulfilment capability enabled
- Live vehicle tracking via Automatic Vehicle Location (AVL)
- Ability to incorporate incentive measures within platform
- Options (if any) for those without smartphone access the unbanked.

- Number of platform users (inc. any limitations)
- Integration through an API, to:
    - provide availability information (e.g. estimated waiting time) for a given origin or origin and destination
    - manage a transaction for booking a journey
    - manage a payment for a ride from a customer's bank / transport account
    - live operational information
- Ability and agreement to provide data, including:
    - Number of registered riders
    - % of ride requests met with an offer
    - % of ride requests where an offer is accepted and a ride completed
    - % of vehicle downtime / off the road
    - Number of hours of operation
    - Aggregated origin-destination information
    - Average passengers per hour
    - In the event of an incident key support data such as all telemetry, video footage. This includes accidents and near misses.

6.4. Software Updates and System Maintenance (non-ADS)
- All software updates, patches, and maintenance activities shall be subject to appropriate planning, risk-assessment, testing and scheduling to minimise the risk of impact to service delivery.

6.5. Digital and Cyber Compliance
- All digital and cyber aspects of the Service should demonstrate compliance with, or exceedance of, the following standards:
    - BSI PAS 1884 Safety operators in automated vehicle testing and trialling – Guide
    - BSI PAS 1885 The fundamental principles of automotive cyber security. Specification
    - E/ECE/TRANS/505/Rev.3/Add.154 UN Regulation No. 155 - Cyber security and cyber security management system
    - ISO/TR 4804:2020 Road vehicles — Safety and cybersecurity for automated driving systems — Design, verification and validation
    - ISO/SAE 21434 Cyber-security
    - NCSC Principles (v 2.1)

- Compliance with standards must be maintained and reaccreditation undertaken as and when required by the relevant standards body.

7. Permissions

The permissions and milestones that will be required to be obtained and met to mobilise and move the service into operation on the pre-defined route.

7.1. Compliance with Relevant Standards

- The APTS shall comply with all applicable local, regional, and national standards, laws and regulations related to transport, safety, and accessibility as detailed within this Specification
- The successful Operator will be required to co-operate with all UK statutory bodies, inc. DfT, DVSA, VCA, Law Commission, as well as insurance bodies.

7.2. Automated Vehicles Act (UK)

- The service and vehicles must comply with the forthcoming Automated Vehicles Act, which will establish a comprehensive legal framework for the safe deployment of self-driving vehicles. This will include:
    - Authorisation of Self-Driving Vehicles: Vehicles must be type-approved for use as AVs and receive Authorised Self Driving Entity (ASDE) status, signifying that they meet the required safety standards.
    - Licensing of Operators: For vehicles operating without a human in charge, a licensed operator will be mandated to oversee the service, ensuring vehicle maintenance, insurance, and overall safe operation.

7.3. Safety Case Submission and Acceptance

- As part of the authorisation assessment, the manufacturer or ASDE must present a detailed service Safety Case, proportionate to the complexity and risks of the service, shall be developed and formally accepted by the relevant UK authorities (e.g., Vehicle Certification Agency). The safety case shall demonstrate the absence of unreasonable risk.
- The NUiC operator is expected to develop a robust Safety Case that covers the Operational Safety Case, the System Safety Case and the Security Safety Case.
- The service Safety Case must pass external independent review by the Tendering Authorities appointed body
- The Safety Case should be made available in an easy-read version for members of the public and wider stakeholders
- The use of simulation-based virtual verification in the safety case evidence must be accompanied by evidence demonstrating the modelling and simulation credibility for the tests undertaken.
- The use of proving ground-based physical verification in the safety case evidence must be accompanied by evidence demonstrating the coverage and appropriacy of the tests undertaken.
- The use of public roads-based trialling in the safety case evidence must be accompanied by evidence demonstrating the identification and coverage of scenarios and edge cases in the trials undertaken.

7.4. Insurance

- Appropriate and comprehensive insurance coverage must be in place, addressing liability in the event of accidents involving automated vehicles as per the Automated and Electric Vehicles Act 2018.

- Levels of indemnity insurance will be provided by the relevant TA within wider tender documentation

7.5. Simulation Testing:

- Evidence of simulation testing is [required | expected], to validate the autonomous driving system's performance, perception, decision-making, and control capabilities across a wide range of scenarios, including edge cases and hazardous situations.

7.6. Closed-Course Testing (Proving Grounds):

- Evidence of appropriate testing on closed test tracks and private roads shall validate the system's performance in a controlled environment, replicating real-world scenarios and challenging situations without public exposure. This includes:
  - Manoeuvring capabilities (e.g., turning, parking, navigating obstacles).
  - Emergency braking and acceleration.
  - Sensor performance validation (e.g., object detection, lane keeping).
  - Response to simulated failures and ODD violations.
  - MRM execution validation.

7.7. Public Road Trialling (with Safety Driver/Operator):

- Initial trials on public roads shall be conducted with a human safety driver or remote operator readily available to assume control. These trials will allow for:
  - Validation of system performance in real-world traffic conditions.
  - Collection of real-world data for further system refinement.
  - Engagement with local authorities, emergency services, and the public.
  - Documentation of all software revisions and extensive testing results.
  - A detailed risk assessment shall be conducted for all public road trials.

7.8. Public Road Deployment (without Safety Driver/Operator):

- Deployment without a safety driver will only occur after the vehicle and service have demonstrably met all safety requirements and received all the necessary authorisations.
- Continuous monitoring of performance, incidents, and safety-related events shall be maintained throughout the operational life of the service.
- Mechanisms for over-the-air (OTA) updates shall be secure and thoroughly tested to ensure they do not introduce new safety risks.

8. Non-Functional Requirements

As well as the specific functional requirements which define what the APTS will do, the following non-functional requirements describe how the APTS should behave.

- **Safe:** The APTS must comply with all aspects of the Statement of Safety Principles as proposed within the Automated Vehicles Act 2024

- **Reliable:** The APTS shall operate with a high degree of reliability, minimizing service disruptions and delays.

- **Available:** The APTS shall be available during specified hours and days, meeting the transport needs of the community and use case identified.

- **Maintainable:** The system shall be designed for ease of maintenance, with readily accessible components and clear maintenance procedures.

- **Scalable:** The APTS shall be scalable to accommodate future growth in demand and expansion of the service area.

- **Secure:** The system shall be secure against physical and cyber threats, protecting passengers, infrastructure, and data and in particular dealing with anti-social behaviour.

- **Usable:** The passenger app and other interfaces shall be user-friendly and intuitive, accessible to all users regardless of technical expertise.

- **Performing:** The APTS shall meet performance targets for travel time, wait time, and passenger satisfaction.

- **Reporting:** The APTS shall provide rich reports that exceed the essential requirements of the SLA's and KPI's to allow a more holistic review of the service being delivered.

9. Autonomous Vehicles Act (2024) Considerations

There are areas that may need to change or be further developed as the AV Act's secondary legislation and guidance develop over the next years, key areas of change include:

Specific Authorisation Requirements

- The document identifies that "Vehicles must be type-approved for use as AVs and receive ASDE status". However, the AV Act will establish detailed authorisation requirements in secondary legislation. The specification will be updated to refer to these specific regulations once they are published, particularly concerning the "self-driving test" and how it is applied.

Statement of Safety Principles

- The AV Act mandates the Secretary of State to prepare a "Statement of Safety Principles" after consultation. While the document covers many safety aspects, it will be aligned with this future statutory guidance once it's available.

Detailed Operator Licensing Scheme

- While mentioning "Licensing of Operators", the AV Act will establish a detailed licensing regime for No-User-in-Charge (NUiC) operators, including requirements for "good repute and financial standing, and capable of competently discharging their regulatory obligations". The specification may need to incorporate more granular requirements from this forthcoming scheme.

Transition Demands (for NUiC - if any remote operator interaction)

- While the service aims for "no user in charge," any scenarios where a remote operator might need to intervene would fall under the broader concept of "transition demands" within the AV Act, which requires clear perceptibility and sufficient time for intervention. Specific requirements around "transition demands" for remote operators might be further clarified.

Cybersecurity Exemption from PSTI

- The document highlights ISO/SAE 21434 for cybersecurity. It's worth noting that automotive vehicles have recently been exempted from the UK's Product Security and Telecommunications Infrastructure (PSTI) regime, as the government intends to bring forth sector-specific regulatory frameworks for vehicle cybersecurity. This exemption might imply more detailed requirements specific to automotive cybersecurity under the AV Act, which the specification should then reflect.

Marketing Terms Protection

- The AV Act intends to protect certain terms so they can only be used to describe authorised self-driving vehicles, preventing misleading marketing. The specification

Automated Public Transport Service Specification. V6.

doesn't explicitly address how the service will ensure its marketing complies with these protected terms, though it's implicitly covered by general legal compliance.

Detailed Legal Accountability

- The AV Act provides a detailed framework for legal accountability, including immunities for users-in-charge (if applicable for other AV features) and where ultimate responsibility lies with the ASDE. Given this is an NUiC service, the ASDE's responsibility for driving will be paramount.

10.   Quality Standards

This section documents expectations regarding items such as customer service, cleanliness of vehicles, and overall service quality.

- The TA will provide details of any specific service standards, Enhanced Partnership arrangements and/or passenger charters.
- The TA will detail how quality standards will be audited, checked and reported.
- The TA will detail customer satisfaction and surveying requirements along with their methodologies.
- The TA will detail any organisation-wide Quality Standards that bidders should be compliant with such as ISO9001:2015.
- The Operator should produce an operations quality manual as per BSi Flex 1887 that provides details of how the Operator will ensure that they consistently achieve the requirements detailed in this document. Sections of the manual should include:
  - Employment Standard Operating Procedures
  - Staff Training Requirements
  - Staff Working Hours etc.
  - Staff Currency Requirements
  - Building/Workstation Requirements

11. Performance Monitoring and Reporting:

The service will be monitored and reported on across the following metrics, the tenderer must ensure that these data points are captured and made available; specific and achievable targets will be negotiated.

Service Delivery:

- Punctuality: Percentage of services arriving on time at scheduled stops.
- Reliability: Measures the consistency of service, including frequency of cancellations or significant delays.
- Service Up-Time: % of time service is technically running as designed
- Journey Time: Average time taken to complete route
- Frequency: Average time between services
- Capacity Utilisation: How efficiently the available seats are being used.

Customer Experience:

- Customer Satisfaction: Overall satisfaction with the service.
- Passenger Numbers:
  - Total number of passengers using the service.
  - Total concessions using the service
- Complaints and Compliments: Summary of formal and informal service feedback (inc. social media sentiment aggregation)
- Information Provision: Availability and clarity of information about routes, timetables, and disruptions.

Financial Performance:

- Revenue: Total income generated from fares and other sources.
- Operating Costs: Expenses associated with running the service.
- Cost per Passenger: Cost of providing the service per passenger.

Safety and Environment:

- Accident / Incident / Near Miss Rate: Number of accidents / Incidents / Near Miss's involving the vehicles.

Reporting frequency and format

- KPI's [will | should] be accessible through a real-time online portal and presented as a compiled report on a monthly basis to the Service Panel.

12. Appendices

12.1. Appendices Schedule

A	Guiding and Supporting Documents
B	Example Tender Route Image
C	Operational Design Domain
D	Service Timetable
E	Guidance on Setting up and Delivering Public Transport services
F	Safety Case support and review

12.2. Appendix A: Glossary of Guiding and Supporting Documents
These documents represent most of the key texts that will inform the delivery of an APTS service.

Reference	Standard / Regulation	Summary
GSD-001	Health and Safety at Work etc. Act 1974	Establishes the legal framework to ensure the health, safety, and welfare of employees and the public in the workplace across Great Britain
GSD-002	Public Passenger Vehicles Act 1981	Regulates the licensing, safety, and operation of public passenger vehicles such as buses and coaches, empowering Traffic Commissioners to oversee compliance and enforce standards
GSD-003	The Road Traffic Regulation Act 1984	Grants authorities the power to regulate road traffic through measures like speed limits, traffic signs, and parking controls to enhance road safety and manage congestion
GSD-004	Transport Act 1985 and 2000	**1985 Act**: Deregulated and privatised bus services outside London to promote competition and reduce public subsidies **2000 Act**: Introduced integrated transport policies, including provisions for air traffic, local transport plans, and public-private partnerships in transport infrastructure
GSD-005	Public Service Vehicles (Registration of Local Services) Regulations 1986	Requires operators of local bus services to register routes, timetables, and fares with the Traffic Commissioner to ensure transparency and regulatory oversight
GSD-006	Road Traffic Act 1988	Consolidates laws on road safety, vehicle standards, driver licensing, and offences such as dangerous driving, drink-driving, and insurance requirements
GSD-007	The Public Service Vehicles (Operators' Licences) Regulations 1995	Sets out the licensing requirements and conditions for operators of public service vehicles to ensure safe, legal, and fair operation of bus and coach services

Reference	Standard / Regulation	Summary
GSD-008	Disability Discrimination Act 1995	Made it unlawful to discriminate against disabled individuals in employment, transport, and access to goods and services, laying the foundation for inclusive practices
GSD-009	The Public Service Vehicles Accessibility Regulations 2000	Mandates that buses and coaches used on scheduled services be accessible to disabled passengers, including features like wheelchair access and priority seating
GSD-010	The Equality Act 2010	Unifies and strengthens previous anti-discrimination laws to protect individuals from unfair treatment based on characteristics such as age, disability, gender, race, religion, and sexual orientation in employment and public life
GSD-011	Regulation (EU) No 181/2011	Establishes rights for passengers in bus and coach transport across the EU, including protections for disabled passengers, compensation for delays or cancellations, and access to information and complaint mechanisms
GSD-012	Bus Services Act (2017) – *if vehicles are over 22 seats*	Empowers local transport authorities in England to improve bus services through enhanced partnerships, franchising schemes, and better passenger information systems
GSD-013	Highways Code (2025)	Provides updated rules and guidance for all UK road users, including new provisions on mobile phone use, electric vehicle charging, and a hierarchy of road users prioritizing pedestrian and cyclist safety
GSD-014	Traffic Regulation Orders (TRO)	Legal instruments used by local authorities under the Road Traffic Regulation Act 1984 to impose traffic controls such as speed limits, parking restrictions, and road closures for safety, environmental, or operational reasons
GSD-015	The Road Vehicles Construction and Use Regulations 1986	Sets out detailed technical and operational standards for the construction, equipment, and use of vehicles on UK roads, covering safety, emissions, and performance requirements
GSD-016	The Road Vehicles Lighting Regulations 1989	Specifies the types, placement, colour, and usage of vehicle lighting to ensure visibility and safety on UK roads, including mandatory lamps and conditions for their use
GSD-017	GB Type Approval Scheme	A post-Brexit regulatory framework requiring vehicle manufacturers to obtain approval from the UK's Vehicle Certification Agency to ensure vehicles and components meet safety and environmental standards before being sold in Great Britain
GSD-018	Automated and Electric Vehicles Act 2018	Provides a legal framework for the safe deployment of automated vehicles and the

Reference	Standard / Regulation	Summary
		expansion of electric vehicle charging infrastructure across the UK, including insurance liability for self-driving cars and requirements for public charge points
GSD-019	Public Passenger Vehicles Act 1981	Consolidates and regulates the licensing, safety, and operation of public passenger vehicles such as buses and coaches, empowering traffic commissioners to enforce compliance and ensure safe, reliable services
GSD-020	The Public Service Vehicles Accessibility Regulations 2000	Mandates that public service vehicles with more than 22 seats used on local or scheduled services be accessible to disabled passengers, including features like wheelchair spaces, priority seating, and audible/visual announcements
GSD-021	The Road Vehicles (Authorised Weight) Regulations 1998	Specifies the maximum authorised weights for various categories of motor vehicles and trailers in the UK to ensure road safety and infrastructure protection
GSD-022	ISO 26262:2018 Road Vehicles - Functional Safety, parts 1 – 12	An international standard that defines a comprehensive framework for ensuring the functional safety of electrical and electronic systems in road vehicles throughout their lifecycle, from concept to decommissioning
GSD-023	ISO 21448:2022 Road vehicles — Safety of the intended functionality	Defines safety requirements and validation methods to address hazards arising from functional insufficiencies in automated systems, even when no system failure has occurred
GSD-024	ISO 22737 Low Speed Automated Driving (LSAD) systems for predefined routes (where applicable)	Specifies performance, system, and testing requirements for Level 4 low-speed automated driving systems operating on predefined routes, supporting safe deployment in controlled environments
GSD-025	ISO 34503:2023 Road Vehicles — Test scenarios for automated driving systems — Specification for operational design domain	Establishes a taxonomy and format for defining the Operational Design Domain (ODD) of automated driving systems, enabling consistent safety assessments and deployment planning
GSD-026	ISO 9001:2015 - international standard for Quality Management Systems (QMS)	ISO 9001:2015 is an international standard that sets out the criteria for a **quality management system (QMS)**, helping organizations consistently meet customer and regulatory requirements through a **process-based, risk-aware, and continuously improving approach**
GSD-0	UL4600 Ed. 2-2022 Standard for Evaluation of Autonomous Products	Provides a comprehensive framework for evaluating the safety of autonomous systems, focusing on their ability to operate safely without human intervention, including hardware, software, and environmental sensing

Reference	Standard / Regulation	Summary
GSD-027	E/ECE/TRANS/505/Rev.3/Add.154 UN Regulation No. 155 - Cyber security and cyber security management system	Establishes mandatory cybersecurity requirements and management systems for vehicle manufacturers to ensure protection against cyber threats throughout a vehicle's lifecycle
GSD-028	ISO/TR 4804:2020 Road vehicles — Safety and cybersecurity for automated driving systems — Design, verification and validation	Describes a framework for designing, verifying, and validating automated driving systems with integrated safety and cybersecurity principles, particularly for SAE Level 3 and 4 vehicles
GSD-029	ISO/SAE 21434 Cyber-security	Defines a structured approach to managing cybersecurity risks in automotive systems across their entire lifecycle, from concept and design to decommissioning
GSD-030	National Cyber Security Centre (NCSC) Principles (v 2.1)	The NCSC Principles v2.1 provide a structured set of cybersecurity design guidelines to help organizations build, operate, and maintain digital and cyber-physical systems that are resilient to attack, emphasizing secure architecture, threat mitigation, and operational assurance throughout the system lifecycle
BSI PAS Documents - suited for established areas where there is a clear understanding of best practices and minimal change is expected.		
GSD-031	**PAS 1880** - Guidelines for Developing and Assessing Control Systems for Automated Vehicles	This document provides guidance on developing and assessing automated control systems for automated vehicles. It is intended to be used in conjunction with other relevant standards and legislation.
GSD-032	**PAS 1881:2022** - Assuring the Operational Safety of Automated Vehicles	This PAS focuses on establishing safety case requirements for automated vehicle trials, ensuring consistency and reducing risks. It guides organizations in developing operational safety cases and building public confidence in automated vehicle technology.
GSD-033	**PAS 1882:2021** - Data for Automated Vehicle Trial Incidents	This PAS provides guidance on data collection and management for incidents that occur during automated vehicle trials.
GSD-034	**PAS 1883** - Operational Design Domain (ODD) Taxonomy	This PAS focuses on the Operational Design Domain (ODD) for automated vehicles, which defines the specific conditions under which an automated driving system is designed to function.
GSD-035	**PAS 1884:2021** – Safety Operators in Autonomous Vehicles	This PAS provides guidance for selection, training and the performance of safety officers for automated vehicle trialling and testing.
GSD-036	**PAS 1885:2018** – Fundamental Principles of Automotive cybersecurity	PAS 1885 applies to the entire automotive development and use lifecycle, encompassing everything from design and implementation to operation and maintenance. It's intended to be applicable to new and modified products, systems, and services.

Reference	Standard / Regulation	Summary
GSD-037	**PAS 11281** - Security for Automated Vehicles	This document focuses on the impact of security on safety, particularly in the context of automated vehicles. It addresses security risks and helps ensure that security measures are in place to prevent misuse of automated vehicles.
GSD-08	**PAS 29000:2021** - Commercially Operated Vehicles Security	This PAS focuses on security measures to mitigate the risk of commercially operated vehicles being used for serious crime.
BSI Flex documents are designed for emerging areas where best practices are still evolving and require iterative development		
GSD-039	BSI Flex 1886 v2.0: System aspects for remote operation of vehicles – Guide	Provides guidance for the safe remote operation of vehicles, covering system aspects like safety, security, communication, and control. This guide supports remote monitoring, driving, and assistance of automated vehicles. It also offers a framework for safety cases related to remotely operated vehicles.
GSD-040	BSI Flex 1887 v2.0: Human factors for remote operations of vehicles – Guide	Offers guidance on human factors crucial for safe and effective remote operations, particularly when a remote operator (RO) isn't onboard the vehicle. It addresses selecting, training, and assessing RO competence, workstation design, and managing ROs. This Flex is intended for organizations implementing remote operation capabilities or services.
GSD-041	BSI Flex 1888 v2.0: Minimal Risk Events (MRX) for Automated Vehicles – Guide	This document provides a framework to enable an automated driving system (ADS) to identify and execute minimal risk manoeuvres when the system degrades or fails. It includes updates on the relationship with other standards, human requests for MRX, and describes MRX as a combination of trigger, minimal risk manoeuvres (MRM), and conditions (MRC). It provides a risk-based categorization of MRMs and MRCs. This guide applies to AVs in developmental testing, advanced trials, and deployment.
GSD-042	BSI Flex 1889 v2.0: Formalised natural language description of scenarios for automated driving systems - Specification	This document helps to formalise the description of scenarios for ADS development and testing.
GSD-043	BSI Flex 1890 v6.0: Connected and Automated Mobility (CAM) - Vocabulary	Defines terms, abbreviations, and acronyms used in the CAM sector to promote clarity, interoperability, and trust. This version has been updated to align with the Automated Vehicles Act 2024 and industry feedback.

Reference	Standard / Regulation	Summary
GSD-044	BSI Flex 1891 v1.0: Behaviour taxonomy for automated driving system (ADS) applications	This Specification document helps categorise and describe ADS behaviours.

Automated Public Transport Service Specification. V6.

12.3. Appendix B: Tender [Route / Area] Map

This is an example map of an APTS service and would illustrate at a high-level the route being tendered. This should be supported by links to online maps such as Google Maps: Example Route Location.

12.4. Appendix C: Target Operational Domain (TOD)

The area, conditions and dynamics within which the Service will be expected to operate in are a crucial defined factor within the APTS. This section provides an example that defines a potential set of minimum requirements.

Target operational domain is the set of operating conditions in which an ADS will be expected to operate, including, but not limited to, environmental, geographical, and time-of-day restrictions, and-or the requisite presence or absence of certain traffic or roadway characteristics

TA's must appropriately define all aspects of the <u>minimum</u> TOD conditions the APTS system must be capable of operating within. *High-level indicative example* provided in table below.

Scenery

Zones	*Private roads: Business parks, university campuses, and hospital grounds.* *Urban public roads: Includes A and B roads within city limits, residential streets, and high streets.* *Shared spaces: Areas with mixed pedestrian and vehicle use, such as town centres and retail parks.* *Speed limits: 20 mph zones common in residential and school areas; 30 mph in general urban roads.*
Drivable Area	*Lane width: Typically 2.5–3.25 m in urban areas.* *Curvature: Must handle tight turns and narrow junctions.* *Gradient: Up to 10%* *Raised tables and speed humps: Traffic calming features must be detected and navigated safely.* *Bus lanes and cycle lanes: May be shared or adjacent; system must respect lane rules.*
Junctions	*Zebra, pelican, puffin, and toucan crossings: Must detect and respond to pedestrian priority.* *Mini-roundabouts and signalised junctions: Common in UK urban layouts.*
Special Structures	
Fixed road structures	*UK-standard road signs and markings: Including TSRGD-compliant signage.* *Traffic signals: Must interpret UK-specific phasing and pedestrian signals.* *Smart infrastructure: V2I communication with traffic lights and digital signage where available.*
Temporary road structures	

Environmental Conditions

Weather	*Normal operation: Clear, overcast, light rain, drizzle, light snow.*

	Degraded operation: Moderate rain, fog, or snow—reduced speed and increased caution.
	Not permitted: Heavy snow, black ice, flooding, or gale-force winds.
Particulates	Dry, wet, and damp tarmac: Normal operation.
	Potholes and uneven surfaces: Common in UK roads; must detect and avoid or slow down.
	Autumn leaf fall: May obscure road markings.
	Winter gritting: Salt and grit may affect sensor performance.
Illumination	Day and night operation: Must handle low-light conditions with headlights and sensor fusion.
	Street lighting: Varies by borough; system must adapt to poorly lit areas.
	Sun glare: Low-angle sun in winter months must be accounted for.
Connectivity	

Dynamic Elements

Traffic	Mixed traffic: Includes black cabs, buses, delivery vans, and private vehicles.
	Traffic density: Operates in low to moderate congestion; high congestion may trigger fallback or remote supervision.
	Bus priority schemes: Must yield or adapt to bus lane rules.
	Pedestrians: Including children, elderly, and those with disabilities (e.g., white cane users).
	Cyclists and e-scooters: Must detect and predict lateral movement and sudden stops.
	Guide dogs and mobility scooters: Special consideration for detection and yielding.
	Urban wildlife: Foxes, cats, dogs, and birds—must detect and respond appropriately.
	Horse riders: Rare but possible in suburban fringe areas; must slow and yield.
	Blue light detection: Must yield to ambulances, police, and fire services.
	Auditory and visual cues: Sirens and flashing lights must be recognised.
Subject Vehicle	Temporary road closures: Due to parades, protests, or construction.
	Crowds and festivals: May require geofenced exclusion or remote monitoring.
	School zones: Time-based speed restrictions and high pedestrian activity

12.5.   Appendix D: Service Timetable

The following are examples of how timetables may be presented:

King St Bus Station → Prince St Hospital	Prince St Hospital → King St Bus Station
First departure no later than **0545**	First departure no later than **0525**
0550 – 1950 – Every **15** Minutes	**0520 – 1930** – Every **15** Minutes
1951 – 2330PM – Every **25** Minutes	**1931 – 2310** – Every **25** Minutes
Last departure no earlier than **2325**	Last departure no earlier than **2305**
Comments (e.g. pinch points / peak) **Low bridge at XX** **Peak traffic 0715 – 0815, allow additional schedule capacity** **Bus gate planned for install 07/26 at junction at High St and Lower High Street**	Comments (e.g. pinch points / peak) **Low bridge at XX**

Monday to Friday Schedule Requirements

Outbound	Return
First departure no later than XXX	First departure no later than XXX
XXX – XXX – Every XX Minutes	XXX – XXX – Every XX Minutes
XXX – XXX – Every XX Minutes	XXX – XXX – Every XX Minutes
Last departure no earlier than XXX	Last departure no earlier than XXX
Comments (e.g. pinch points / peak)	Comments (e.g. pinch points / peak)

Automated Public Transport Service Specification. V6.

Saturday Schedule Requirements

Outbound	Return
First departure no later than XXX	First departure no later than XXX
XXX – XXX – Every XX Minutes	XXX – XXX – Every XX Minutes
XXX – XXX – Every XX Minutes	XXX – XXX – Every XX Minutes
Last departure no earlier than XXX	Last departure no earlier than XXX
Comments (e.g. pinch points / peak)	Comments (e.g. pinch points / peak)

Sunday Schedule Requirements

Outbound	Return
First departure no later than XXX	First departure no later than XXX
XXX – XXX – Every XX Minutes	XXX – XXX – Every XX Minutes
XXX – XXX – Every XX Minutes	XXX – XXX – Every XX Minutes
Last departure no earlier than XXX	Last departure no earlier than XXX
Comments (e.g. pinch points / peak)	Comments (e.g. pinch points / peak)

Bank Holiday Schedule Requirements

Outbound	Return
First departure no later than XXX	First departure no later than XXX
XXX – XXX – Every XX Minutes	XXX – XXX – Every XX Minutes
XXX – XXX – Every XX Minutes	XXX – XXX – Every XX Minutes
Last departure no earlier than XXX	Last departure no earlier than XXX
Comments (e.g. pinch points / peak)	Comments (e.g. pinch points / peak)

Automated Public Transport Service Specification. V6.

12.6.   Appendix E: Guidance on delivering Public Transport services

Information is available as a separate document on the GovUK website.

https://www.gov.uk/guidance/a-guide-to-registering-and-operating-local-bus-services-in-england-and-wales

Bidders are encouraged to ensure familiarity with all aspects of the delivery of public transport services in England and Wales.

12.7.   Appendix F: Safety Case support and review

These documents are key support documents in the creation of Safety Cases for CAV trials and deployments.

Zenzic Safety Case framework (2021) (2 versions, 1 for Creators, 1 for reviewers)

The framework's primary objectives are to provide a unified approach to safety case creation and evaluation, ensuring consistency across CAM Testbed UK and facilitating seamless movement between testbeds for organizations. It offers detailed safety requirements, best-practice risk management processes, examples and templates.

DfT Code of Practice: Automated Vehicle Trialling (maintained website: GOV.UK - DfT - CoP)

The Code aims to support the safe trialling of automated vehicles, foster public confidence, encourage collaboration among relevant bodies, and promote information sharing to maintain high safety standards

BSI PAS 1881:2022 - Assuring the Operational Safety of Automated Vehicles

sets the minimum requirements for managing safety during the development testing and trialling of automated vehicles on and off public roads

Automated Public Transport Service Specification. V6.

13.   Proposed Procurement Strategy – For Market Consultation

Key Contract Information Summary

Depart' ment:	

Estimated Contract Value	
Collaborating Authorities	

Contract Process	
Contract Type	
Procedure	

Contract Type	
Contract Start Date*	
End Date of Initial Period*	
Extension Option 1*	
Extension Option 2*	
Extension Option 3*	

Intended Bidder	Public Transport Operator / AV Developer

*Indicative dates only.

Automated Public Transport Service Specification. V6.

Indicative Process

1. Market engagaement	2. Pre-Qualification	3. Capability Demonstration	4. Tender	5. Service Launch
• Market Engagement • Develop final Specification	• Issue full Specification and requirements for Capability Demonstrations • Supplier submissions • Submission evaluation	• Up to five stages of proving capability to deliver against Specification	• Bidders who have passed Capability Demonstration submit bid for full service • Cost and Quality evaluation • Contract awarded	• Service Set-up • Service monitoring

Indicative Timetable

	Start	End
1. Market engagement		
Market Engagement		
Develop final Specification		
2. Pre-Qualification		
Issue full Specification and requirements for progressing to Capability Demonstrations		
Supplier submissions		
Submission evaluation		
3. Capability Demonstration		
Up to five stages of proving capability to deliver against Specification		
4. Tender		
Bidders who have passed Capability Demonstration submit bid for full service		
Cost and Quality evaluation		
Contract awarded		
5. Service Launch		
Service Set-up		
Service monitoring		

Indicative Pre-Qualifying sift

1. Lead organisation financial standing checks
2. Technology and Service Delivery certifications / accreditations in place
3. Experience / references
4. Legal / criminality checks
5. Technology solution suitability

Indicative Capability Demonstration milestones

1. Self-driving technology proven of being able to perform within ODD parameters specified within Specification
2. Solution eco-system proven to function as designed
3. Software integrations proven to function as designed
4. Resource and mobilisation plan accepted

Elements of typical public sector tender pack

Contract Information
Key Contract Information Summary
Tendering Timetable
Contract Description
Service Background Information
Contract Term
Scope of Requirement
Collaborating Authorities
TUPE
Pension Requirements
Off-Payroll Working (IR35)
Contract Price
The Service End Users
Location of Contract Delivery/ Performance
Contract Management
Key Performance Indicators
Social Value
Environmental
Insurance
Finance
Parent Company Guarantee
Funding
Domestic Reverse Charges
Appendices Schedule
Specification
Introduction
Statement of Requirements