STAPLE

Catalogue of connected and automated driving test sites

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Catalogue of connected and automated driving test sites

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Executive summary

The overall aim of STAPLE is to provide a comprehensive review of technological and non-technological aspects of the most relevant connected and automated test sites and test beds across Europe and beyond, in order to understand the impact of these sites on the NRAs' core business and functions. The project will provide road administrations with the necessary know-how on connected and automated driving test sites, with the aim of supporting their core activities, such as road safety, traffic efficiency, customer service, maintenance and construction. The project builds on previous work by CEDR and other national and European organizations, as well as on the consortium's expertise from a number of relevant research initiatives.

This deliverable presents the approach taken in STAPLE for identifying a wide range of connected and automated driving test sites and test beds across Europe and beyond, as well as a detailed Catalogue of 37 test sites/beds. While data on 39 test sites and beds were collected, two sites offered only confidential information and their data is not available in this version of this deliverable. In addition, the initial pre-selection and assessment of sites/beds for further investigation is also described.

The initial review encompassed a wide variety of sites/beds, in terms of location, size, years of operation, experience and other factors. The consortium looked at already existing sites with years of experience as well as new and developing ones. The focus was on test sites and test beds for passenger cars, freight transport operations and shared mobility services. The search yielded over 70 test sites and test beds in 20 countries inside and outside Europe, including the USA, China, Australia and South Korea.

Based on the consortium expertise and as well as input and feedback from the PEB, a detailed data collection procedure was undertaken for obtaining information on each site, such as location, size, automated use cases tested, type of environment, physical and digital infrastructure support, connectivity employed and other factors. This resulted in a Catalogue of 37 test sites and test beds that can be used as a point of reference going forward but can also be used as a standalone output of STAPLE.

Lastly, an first assessment and pre-selection of the test sites/beds was performed, to evaluate their feasibility for further investigation in the next activities of the project. The qualitative assessment took into account criteria such as location, availability of data, longevity of the site/bed, purpose, confidentiality. The pre-selection yielded the following test sites/beds (in no particular order):

1. Alp.Lab – Austrian Light Vehicle Proving Region for Automated Driving, Austria
2. Testregion DigiTrans, Austria
3. TFN – Testbed Lower Saxony, Germany
4. A2-M2 Connected Corridor, UK
5. Testbed Midlands Future Mobility, UK
6. Colas IPV – Testbed Colas Impact Protection Vehicle, UK
7. Horiba – MIRA TIC-IT, UK
8. AstaZero AB, Sweden
9. AURORA – E8 Aurora, the Arctic Intelligent Transport Test Ecosystem, Finland
10. BOREALIS – Test Ecosystem for cross-border testing with Finland, Norway
11. ZalaZONE Automotive Proving Ground, Hungary
12. TRANSPOLIS, France

13. CLL – Catalonia Living Lab, Spain
14. IDIADA Proving Ground, Spain

The next steps of the project include the final selection of test sites to be taken into the next work package for further investigations, the identification of key performance areas for NRAs' core business and further data collection procedures on selected test sites/beds. As stakeholder involvement is paramount to the success of the project, two stakeholder workshops will be held in March and April 2019, where first project results will be presented to national road authorities and other relevant stakeholders.

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1 Introduction

The CEDR Transnational Research Programme was launched by the Conference of European Directors of Roads (CEDR). CEDR is the Road Directors' platform for cooperation and promotion of improvements to the road system and its infrastructure, as an integral part of a sustainable transport system in Europe. Its members represent their respective National Road Authorities (NRA) or equivalents and provide support and advice on decisions concerning the road transport system that are taken at national or international level.

The participating NRAs in the **CEDR Call 2017: Automation** are **Austria, Finland, Germany, Ireland, Netherlands, Norway, Slovenia, Sweden** and **the United Kingdom**. As in previous collaborative research programmes, the participating members have established a Programme Executive Board (PEB) made up of experts in the topics to be covered. The research budget is jointly provided by the NRAs as listed above.

The aim of the STAPLE project is to provide a comprehensive review of technological and non-technological aspects of the most relevant connected and automated driving test sites across Europe and beyond, in order to understand the impact of these sites on the NRA's core business and functions. This project will provide NRAs with the necessary know-how on connected and automated driving tests sites and test beds, with the aim of supporting their core business activities, such as road safety, traffic efficiency, customer service, maintenance and construction.

The STAPLE consortium will support the NRAs through the following objectives:

- Provide an overview of connected and automated test sites/beds in Europe and beyond
- Provide a catalogue of these sites and detail how they contribute to NRA priorities
- Undertake a detailed investigation into a selected number of test sites including visiting a selection of sites
- Assess the implications of the findings of the test sites for future NRA options
- Analyse and report on the practical learnings from test sites worldwide, including gaps where NRA needs are not addressed
- Provide a report and recommendations for future research and test sites focus.

This deliverable presents the results of work package 2, where a wide range of connected and automated driving test sites and test beds were identified and documented. A detailed data collection yielded a catalogue of 39 test sites and test beds across Europe, the USA, Australia, South Korea and China that can be used as a point of reference going forward. While data on 39 test sites and beds were collected, two sites offered only confidential information and their data is not available in this version of this deliverable. The processes used to arrive at a shortlist of test sites/beds to be taken in the project for further investigation are also presented.

The deliverable starts with a description of the process of identifying and collecting the test sites that will be included in the first stage of the project. Chapter 3 describes 37 test sites and test beds that have been investigated through literature review, expert knowledge and data collection. Chapter 4 presents a preliminary analysis of the test sites to be taken in the next step of the project, as well as the methodology to be used for selecting the final sites. Chapter 5 describes the next steps planned in the project.

2 Overview of connected and automated driving test sites

1.1 Initial review

The aim of work package two of STAPLE was to get a broad overview of the existing connected and automated test sites across Europe and beyond. A comprehensive desk study was carried out by the consortium to identify the most relevant test sites and test beds across Europe as well as the USA, South Korea, China and Australia. This was complemented by the consortium's knowledge and involvement in connectivity and automation related projects, as well as the support of the PEB members.

The review encompassed a wide variety of sites, in terms of location, size, years of operation, experience and other factors. The consortium looked at already existing sites with years of experience as well as new and developing ones. The focus was on test sites and test beds for passenger cars, freight transport operations and shared mobility services.

The search yielded over 70 test sites and test beds in 20 countries inside and outside Europe, including the USA, China, Australia and South Korea. Annex 1 presents the full list of identified connected and automated test sites and test beds (non-exhaustive).

1.2 First data collection and criteria

After the identification, the next step was to learn more about each individual test site/bed to investigate which ones would be most relevant for the NRAs. To this end, a set of 16 criteria were considered. The criteria were decided based on consortium expertise, with the inputs and feedback of the PEB members and the Project Officers. The criteria were also influenced by the activities of the other two projects in the CEDR Call Automation programme, i.e. MANTRA and DIRIZON, as to facilitate cooperation and synergies between the three projects. The following criteria were considered and collected:

1. **Name**: Full name of test site or test bed
2. **Short name**: Abbreviation
3. **Partners/Consortium**: Specification of the organizations that own and/or manage the site/bed
4. **Location**: Coordinates, city and/or address of the test site area
5. **Type of ownership**: Specification whether it is a public /private site or other type of joint/separate ownership
6. **Lifespan**: Definition of the start of the operation of the test site/bed, as well as the planned duration (e.g. 0 to 2 years, more than 5 years, undefined)
7. **Business areas**: Statement on the specific focus of the site/bed, such as road safety, traffic efficiency, customer service and maintenance /construction
8. **Use cases tested**: Specification of the connected and automated use cases that could be tested on the premises of the test site/test bed, such as Highway Chauffeur, Automated Shuttle Bus, Freight Vehicles Platooning, Driverless maintenance and road works vehicles, etc.
9. **Size**: Size of the test site/bed, in km or km^2
10. **Business model**: Description of the business model employed by the site/bed consortium for running the test site/test bed
11. **Environment**: Statement on whether the site environment is closed or an open area (e.g. closed test track, public motorway, public bus route)

12. **R&D/ Industry projects that are/were conducted**: Specification of previous or current research or industry projects where connected and automated driving tests were/are performed at the specific site/bed
13. **Type of environment**: Specification of the type of road environment encompassed in the test site/bed, e.g. urban, motorway, inter-urban, rural
14. **Connectivity employed**: Description of the network technology employed at the site/bed to facilitate testing, e.g. ITS G5, 3G/4G/5G, LTE V2X and others
15. **Infrastructure support**: Description of the physical and digital infrastructure that the test site/test bed is equipped with, e.g. cameras, HD maps, road markings, RSUs, radar.
16. **Other specific characteristics**: Description of other particular characteristics of the test site/test bed, such as electric vehicles charging, intersections, tunnels, speed limits and others.

The data collection was divided into two phases, which were conducted subsequently. First, publicly-available data was collected for each identified test site/test bed. Secondly, test site owners and operators were contacted towards providing more information on each of the criteria described above. In order to facilitate the data collection, a Description Form was developed that site operators could fill in and send back to the consortium (please see Annex 2). The operators were identified and contacted through the consortium's wide network of contacts, with additional support from the POs and the PEB members. Each test site was contacted with a standardized email that provided details on the aim and outputs of STAPLE, as well as details regarding the data collection process. The level of confidentiality was set by the operators themselves, i.e. they chose the level of information and detail that they were willing to provide the consortium.

The next chapter provides a catalogue of 37 connected and automated test sites and test beds with detailed descriptions.

3 Catalogue of connected and automated test sites

1.1 Alp.Lab GmbH (Austria)

ALP.Lab GmbH	
General description	
Name	ALP.Lab GmbH Austrian Light Vehicle Proving Region for Automated Driving
Short name	ALP.Lab
Partners/Consortium	AVL, MAGNA Steyr, Virtual Vehicle, TU Graz, Joanneum Research
Location	Graz / Austria
Type of ownership (e.g. NRA involvement)	☐ Public ☒ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☒ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☒ Traffic efficiency ☐ Customer Service ☐ Maintenance/Construction ☒ Other, please specify: Test region for automated driving
Use Cases tested	☒ Highway Chauffeur ☐ Automated Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: All ADAS and AD functions for light vehicles

Size (e.g. Km, Km²)	~400km Highway Urban and interurban in plan
Business model	One-stop-shop for all needed infrastructure to test and develop ADAS/AD functions.
Environment	☒ Closed ☒ Open area ☒ Other, please specify: • SiL/MiL, ViL on testbed • Driving simulator • Data handling and service
R&D/Industry projects that are/were conducted at this test site/bed	Data collection, storage and analyses of real road data. EuroNCAP tests

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☒ Inter-Urban ☐ Other, please specify:
Connectivity employed	☒ ITS G5 ☐ 3G ☒ 4G ☒ LTE-V2X ☒ Other, please specify: Pilot for 5G
Infrastructure support	Digital infrastructure: ☒ Cameras ☒ HD maps ☒ Other, please specify: • Radar and roadside sensors for traffic flow • Weather information Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	Toll stations, border crossing, tunnels – open area and closed (by end of 2019), mountain roads. Ice track.

1.2 AV Living Lab (Slovenia)

AV Living Lab	
General description	
Name	AV Living Lab
Short name	AVLL
Partners/Consortium	Partners in industries, academia: Data analytics, Blockchain, 5G, AI/machine learning, smart grid, retail, human interaction (kids-to-elderly), 3 universities
Location	Ljubljana, Slovenia; https://www.google.com/maps/@46.0665863,14.543521,15.92z
Type of ownership (e.g. NRA involvement)	☒ Public ☐ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2018 After 65 years of transformation from warehouses, shopping center, entertainment/leisure area to cross-industry living lab. Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☒ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☒ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction ☒ Other, please specify: • Cross-industry city as a lab testing environment, • TRL4-TRL8 product, applications, services, platforms testing, • AV driving in urban environments, • 5G/communications networks testing, • Human-machine interaction (also kids, elderly, disabled), • AV driving simulator and with human bio feedback analysis, • Mobility services,

	• Business models testing.
Use Cases tested	☐ Highway Chauffeur ☒ Automated Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: • Smart Parking, LoRa, • Precision navigation (RTK/differential GPS), • Human responses to AV shuttle drive, • Car lights and sounds human interactions, • AV driving simulator, 4 mobility services.
Size (e.g. Km, Km^2)	11 km of roads, intersections/crossings, roundabouts, 0.5 km2 area
Business model	City as a Lab physical infrastructure and services offered to vendors of products/services/platforms for proof of concepts, demonstrations, showcase/use case testing, analysis.
Environment	☒ Closed ☒ Open area ☒ Other, please specify: Environment can be adapted from fully closed (e.g. large garage) to semi-open, or open, during specific day time intervals.
R&D/Industry projects that are/were conducted at this test site/bed	Smart parking, precision navigation (RTK/differential GPS), human responses to AV shuttle drive, car lights and sounds human interactions, 5G MIMO testing, 4 mobility services, AV driving simulator.

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☐ Motorway ☐ Inter-Urban ☒ Other, please specify: • 11 km of roads with buildings, skyscrapers, recreational facilities, hotel, multiplex cinema, retail shops
Connectivity employed	☒ ITS G5 ☒ 3G ☒ 4G ☒ LTE-V2X ☒ Other, please specify: • LoRa, G5, • V2X PC5 available through partners, • 3 mobile operators offer full 4G LTE/A coverage, • 5G experiments done, spectrum license available on-demand (sub 1 GHz bands, 2 GHz bands, 3.5-3.8 GHz, 5.9 GHz free)
Infrastructure support	Digital infrastructure: ☒ Cameras ☒ HD maps ☒ Other, please specify: HD map and point cloud model of environment available on demand through partners. Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☒ Other, please specify: • Comprehensive different road types markings, signs. • Intelligent signs with V2X can be installed on demand.
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	Intersections, roundabouts single and dual lane, one-way, mixed car-bicycle-pedestrian streets. EV charging stations. Car and bicycle sharing. Speed limit 30 km/h; on selected roads 60 km/h. RSU can be installed on demand. Infrastructure can be adapted, changed on selected roads as required.

1.3 Testbed Lower Saxony (Germany)

Testbed Lower Saxony	
General description	
Name	Testbed Lower Saxony
Short name	TFN
Partners/Consortium	Owner: DLR Supporting consortium: VW, Continental, Wolfsburg AG, ADAC, Oecon, Nordsys, Siemens, IAV, Ministries of Lower Saxony https://verkehrsforschung.dlr.de/de/projekte/testfeld-niedersachsen-fuer-automatisierte-und-vernetzte-mobilitaet
Location	Braunschweig – Hannover – Hildesheim – Salzgitter – Wolfsburg; Germany
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☐ PPT – joint ☒ Other, please specify: Non-profit organization
Lifespan (past and future planned activities)	Start of operation (year): Urban: 2014; Motorway: end of 2019 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☒ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☒ Traffic efficiency ☒ Customer Service ☒ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☒ Highway Chauffeur ☐ Automated Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☐ Other, please specify:

Size (e.g. Km, Km²)	Up to 280 km motorway and inter urban + 12 km urban area
Business model	Operation as a large-scale research infrastructure by DLR
Environment	☒ Closed (in planning) ☒ Open area ☐ Other, please specify:
R&D/Industry projects that are/were conducted at this test site/bed	Digitaler Knoten 4.0, PEGASUS

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☒ Inter-Urban ☐ Other, please specify:
Connectivity employed	☒ ITS G5 ☐ 3G ☐ 4G ☐ LTE-V2X ☒ Other, please specify: 5G in planning
Infrastructure support	Digital infrastructure: ☒ Cameras ☒ HD maps ☒ Other, please specify: C2X Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	Tunnels, Intersection, Variable message signs, C2X emulation.

1.4 Test region DigiTrans (Austria)

Test region DigiTrans	
General description	
Name	Testregion DigiTrans
Short name	DigiTrans
Partners/Consortium	AIT Austrian Institute of Technology GmbH, Fachhochschule Oberösterreich F&E GmbH, Linz Center of Mechatronics GmbH, REFORM-WERKE - Bauer & Co Gesellschaft m.b.H., Hödlmayr International AG, Members of Verein DigiTrans e.V.
Location	Linz, Austria
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☒ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2018 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☒ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☒ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction ☒ Other, please specify: • Testing and development support of automated vehicles, systems and components in the areas of special vehicles and commercial vehicles as well as in the logistics sector.
Use Cases tested	☐ Highway Chauffeur ☐ Automated Shuttle bus ☒ Freight Vehicles platooning ☒ Driverless maintenance and road works vehicles ☒ Other, please specify: • Automated platooning • Automatic multimodal charging

	• Automatic transportation systems in urban or industrial areas • Connected vehicles and their infrastructure • Communal vehicles
Size (e.g. Km, Km^2)	Several local sites are going to be adapted to be used as proving grounds.
Business model	• Test design • Data collection • Test setup / installation • Operation and support of testing • Evaluation of test results • Consulting
Environment	☐ Closed ☐ Open area ☒ Other, please specify: Mix of open and closed areas and mobile test infrastructure.
R&D/Industry projects that are/were conducted at this test site/bed	Autility, Connecting Austria are already on the way. Several further test pilot projects under formulation.

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☒ Inter-Urban ☒ Other, please specify: • Company site • Surrounding countryside *Planned (Environment is going to be added under a stepwise phase in plan)*
Connectivity employed	☒ ITS G5 ☒ 3G ☒ 4G ☒ LTE-V2X ☒ Other, please specify: • Proprietary RF • Cooperative radar • Wireless sensor networks *Planned (The connectivity is going to be brought live under a stepwise phase in plan)*
Infrastructure support	Digital infrastructure: ☒ Cameras ☒ HD maps

	☒ Other, please specify: • Mapping of individual test sites, • Software platform for collection an analysis of test data, • Localization systems, • Various measurement systems; <u>Physical infrastructure</u>: ☒ Road markings ☒ Road edges delineation ☐ Other, please specify: • Automated platform for ADAS Testing, • Various track elements / road situations; *Planned (The infrastructure is going to be brought to life under a stepwise phase in plan.)*
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	Smart Road Signal Systems

1.5 A2-M2 Connected Corridor (UK)

Test Pilot A2-M2 Connected Corridor	
General description	
Name	A2-M2 Connected Corridor
Short name	A2-M2 Connected Corridor
Partners/Consortium	Highways England, Kent County Council, Transport for London, UK Department for Transport, InterCor, ERTICO
Location	London – Kent, UK
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☒ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2018 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☒ > 5 years ☐ Undefined ☐ Other, please specify: • Phase 1 pilot ends March 2020 • Phases 2 and 3 yet to start
Business areas	☐ Road safety ☒ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☐ Highway Chauffeur ☐ Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: • Probe vehicle data to roadside • Green light optimisation • In-vehicle signage
Size (e.g. Km, Km^2)	119 km
Business model	Optimising UK business in this area. Improving Highways England operations

Environment	☐ Closed ☐ Open area ☒ Other, please specify: dual carriageway / motorway
Research/Industry projects that were conducted at this test site/bed	GLOSA, Hybrid communications

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☒ Inter-Urban ☐ Other, please specify:
Connectivity employed	☒ ITS G5 ☐ 3G ☐ 4G ☐ LTE-V2X ☐ Other, please specify:
Infrastructure support	Digital infrastructure: ☐ Cameras ☐ HD maps ☒ Other, please specify: V2I (probe vehicles) Physical infrastructure: ☐ Road markings ☐ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	Urban section in London for Phase 1 and 1a. Will move to dual carriageway and motorway in phases 2 and 3.

1.6 Test bed Smart Mobility Living Lab (UK)

Test bed Smart Mobility Living Lab	
General description	
Name	Smart Mobility Living Lab
Short name	SMLL
Partners/Consortium	Innovate UK (part-funder), TRL, Cisco, Transport for London, DG Cities, Cubic, Queen Elizabeth Olympic Park, and Loughborough University
Location	London, UK
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☒ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2017 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☐ > 5 years ☐ Undefined ☒ Other, please specify: Some projects finished. Other potential projects
Business areas	☐ Road safety ☐ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☐ Highway Chauffeur ☐ Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: • Driverless taxis, • Delivery vehicles, • Public perception
Size (e.g. Km, Km²)	Two sites – Greenwich Peninsula and Queen Elizabeth Park (London 2012 Olympics site) - campus level

Business model	Job creation, UK plc wealth
Environment	☒ Closed – QEP semi-closed, like campus ☒ Open area – Greenwich open ☐ Other, please specify:
Research/Industry projects that were conducted at this test site/bed	Driverless taxis, last mile delivery, trial of autonomous bus, last-mile public transport

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☐ Motorway ☐ Inter-Urban ☒ Other, please specify: campus
Connectivity employed	☐ ITS G5 ☒ 3G ☒ 4G ☐ LTE-V2X ☐ Other, please specify: • LiDAR, • GPS
Infrastructure support	Digital infrastructure: ☐ Cameras ☐ HD maps ☐ Other, please specify: Physical infrastructure: ☐ Road markings ☐ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	

1.7 Test bed UK Autodrive (UK)

Test bed UK Autodrive	UK Autodrive
General description	
Name	UK Autodrive
Short name	UK Autodrive
Partners/Consortium	
Location	Milton Keynes / Coventry, UK
Type of ownership (e.g. NRA involvement)	☒ Public ☐ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2015 Planned duration: ☐ 0 – 2 years ☒ 2 – 5 years ☐ > 5 years ☐ Undefined ☒ Other, please specify: Finished 2018
Business areas	☐ Road safety ☒ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☐ Highway Chauffeur ☐ Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: • Driverless pods, • Self-driving cars
Size (e.g. Km, Km²)	Two sites – Horiba test site, Milton Keynes
Business model	Technology trials
Environment	☒ Closed – track trials ☒ Open area – MK trial section ☐ Other, please specify:

Research/Industry projects that were conducted at this test site/bed	Driverless pods in urban areas, driverless vehicles

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☐ Motorway ☐ Inter-Urban ☒ Other, please specify: Track
Connectivity employed	☐ ITS G5 ☐ 3G ☐ 4G ☐ LTE-V2X ☐ Other, please specify: • LiDAR, • GPS
Infrastructure support	Digital infrastructure: ☐ Cameras ☐ HD maps ☐ Other, please specify: Physical infrastructure: ☐ Road markings ☐ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	

1.8 UK-CITE (UK)

UK-CITE	
General description	
Name	UK-CITE
Short name	UK-CITE
Partners/Consortium	Visteon Engineering Services Ltd, Jaguar Land Rover, Coventry City Council, Highways England, Horiba-MIRA, Huawei Technologies, Siemens, Transport for West Midlands, Vodafone, WMG at University of Warwick
Location	West Midlands, UK 1. Smart Motorway (M42) 2. Motorway (M40) 3. Expressway(A46) 4. A-road (A45) 5. Urban (A4114/A4035)
Type of ownership (e.g. NRA involvement)	☒ Public ☐ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2016 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☐ > 5 years ☐ Undefined ☒ Other, please specify: Finished 2018
Business areas	☐ Road safety ☒ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☐ Highway Chauffeur ☐ Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: In-vehicle signage
Size (e.g. Km, Km²)	42-mile smart communications test bed (68 km)
Business model	Communications trials

Environment	☒ Closed – track trials ☒ Open area – UK Roads ☐ Other, please specify:
Research/Industry projects that were conducted at this test site/bed	This site has finished, but plans are in place to roll the environment into the Midlands Future Mobility Programme.

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☐ Inter-Urban ☒ Other, please specify: Track
Connectivity employed	☐ ITS G5 ☐ 3G ☐ 4G ☐ LTE-V2X ☒ Other, please specify: • ITS-G5 V2V (802.11p) • Cellular V2V (LTE-V) • Cellular & ITS-G5 V2I • Cellular V2N
Infrastructure support	Digital infrastructure: ☐ Cameras ☐ HD maps ☐ Other, please specify: Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	

1.9 Smart City Mobility Centre (UK)

Smart City Mobility Centre	
General description	
Name	Smart City Mobility Centre'
Short name	Smart City Mobility Centre'
Partners/Consortium	WMG, Jaguar Land Rover, University of Warwick £20 million investment
Location	West Midlands, UK
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☒ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2019 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☐ > 5 years ☒ Undefined ☐ Other, please specify:
Business areas	☐ Road safety ☒ Traffic efficiency ☐ Customer Service ☐ Maintenance/Construction ☒ Other, please specify: Data
Use Cases tested	☐ Highway Chauffeur ☐ Automated Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: Data
Size (e.g. Km, Km²)	
Business model	
Environment	☐ Closed ☒ Open area ☐ Other, please specify:

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☐ Motorway ☐ Inter-Urban ☐ Other, please specify:
Connectivity employed	☐ ITS G5 ☐ 3G ☐ 4G ☐ LTE-V2X ☐ Other, please specify: 5G
Infrastructure support	Digital infrastructure: ☐ Cameras ☐ HD maps ☐ Other, please specify: Physical infrastructure: ☐ Road markings ☐ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	New Smart City Mobility Centre will create ground breaking driverless capable and electric vehicle technology as part of a multi-million-pound pilot in Warwickshire and the West Midlands. The new Smart City Mobility Centre will create state-of-the-art vehicle modular architectures and integrated driverless capability to support smart cities that could help make congestion, emissions and road traffic accidents a thing of the past. It will prototype new vehicles and systems that will transform UK transport, by bringing together WMG at the University of Warwick's research expertise, and Jaguar Land Rover's leading research and engineering capabilities. It will be Europe's most extensive and significant integration of technology research projects at such a scale. Combining the very latest research, transport data, infrastructure, and vehicle prototyping. These will be tested in real world conditions alongside a specially designed 5G communications network on the University of Warwick's main campus.
R&D/Industry projects that are/were conducted at this test site/bed	5G trials, new battery technology

1.10 Test bed ServCity (UK)

Test bed ServCity	
General description	
Name	ServCity
Short name	ServCity
Partners/Consortium	JLR (lead), Addison Lee, Uni. Nottingham, TSC, TRL Total: £19.8 million, £11.15 million grant
Location	London / West Midlands, UK
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☒ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): Project awarded 2018 Planned duration: ☐ 0 – 2 years ☒ 2 – 5 years ☐ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☐ Road safety ☒ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction ☒ Other, please specify: Air quality
Use Cases tested	☒ Highway Chauffeur (Driverless taxi) ☐ Automated Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☐ Other, please specify:
Size (e.g. Km, Km^2)	N/A – London / West Midlands
Business model	Driverless taxi. Technology development
Environment	☐ Closed ☒ Open area ☐ Other, please specify:
R&D/Industry projects that are/were conducted at this test site/bed	AV trials, modelling

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☐ Motorway ☒ Inter-Urban ☐ Other, please specify:
Connectivity employed	☐ ITS G5 ☐ 3G ☐ 4G ☐ LTE-V2X ☐ Other, please specify:
Infrastructure support	Digital infrastructure: ☐ Cameras ☐ HD maps ☐ Other, please specify: Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	ServCity project, led by Jaguar Land Rover with Addison Lee, Transport Systems Catapult, TRL and the University of Nottingham, will develop a mobility service based in London using 6 autonomous Land Rover Discovery vehicles. Building on expertise from the Government-backed UK Autodrive project, the consortium will test and further develop existing JLR sensing and autonomy systems in Coventry and the Midlands before deploying a pilot of a premium mobility service across four Greater London boroughs. The project will also develop analytical models to understand and demonstrate the wider positive impacts of connected and autonomous vehicles on cities - from reduced air pollution to easing congestion.

1.11 Test bed CAV Forth (UK)

Test bed CAV Forth	
General description	
Name	Project CAV Forth
Short name	Project CAV Forth
Partners/Consortium	Fusion processing (lead), UWE, Alexander Dennis, University of Edinburgh Napier, ESP Systex, Transport Scotland, Stagecoach
Location	Edinburgh, UK
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☒ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): Project awarded 2018 Planned duration: ☐ 0 – 2 years ☒ 2 – 5 years ☐ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☐ Road safety ☒ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☐ Highway Chauffeur ☐ Automated Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: Driverless bus
Size (e.g. Km, Km²)	~20 km
Business model	Driverless bus / taxi. Technology development
Environment	☐ Closed ☒ Open area ☐ Other, please specify:
R&D/Industry projects that are/were conducted at this test site/bed	

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☐ Motorway ☒ Inter-Urban ☐ Other, please specify:
Connectivity employed	☐ ITS G5 ☐ 3G ☐ 4G ☐ LTE-V2X ☐ Other, please specify:
Infrastructure support	Digital infrastructure: ☐ Cameras ☐ HD maps ☐ Other, please specify: Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	An Autonomous Bus Service from Park & Ride Across Forth Bridge to Edinburgh Park Train & Tram Interchange Fusion Processing (lead), Uni of West of Eng., Alexander Dennis, Edin. Napier Uni. & ESP Systex, Transport Scotland, Stagecoach. Total: £6.09 million, £4.35 million grant. Project CAV Forth, led by Fusion Processing, will bring together organisations from across the UK to develop a high capacity Autonomous Bus Pilot Service across the Forth Bridge – a UNESCO World Heritage site. The project will convert five full-size Alexander Dennis single decker manually driven busses into autonomous vehicles. These self-driving buses will provide a service capable of carrying up to 42 passengers 14miles across the Forth Bridge to Edinburgh Park Train and Tram interchange. With buses every 20 minutes this could provide an estimated 10,000 weekly journeys and support the case for rolling out similar services across the UK.

1.12 Test bed Apollo (UK)

Test bed Apollo	
General description	
Name	Project Apollo
Short name	Project Apollo
Partners/Consortium	Addison Lee (lead), DG Cities – Greenwich (site), Oxbotica, Immense Simulations, Nominet Total: £15.15 million, £8.84 million grant.
Location	London, UK
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☒ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): Project awarded 2018 Planned duration: ☐ 0 – 2 years ☒ 2 – 5 years ☐ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☐ Road safety ☐ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☒ Highway Chauffeur (Driverless taxi) ☐ Automated Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☐ Other, please specify:
Size (e.g. Km, Km²)	N/A - London
Business model	Driverless taxi. Technology development
Environment	☐ Closed ☒ Open area ☐ Other, please specify:
R&D/Industry projects that are/were conducted at this test site/bed	AV trials, modelling

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☐ Motorway ☐ Inter-Urban ☐ Other, please specify:
Connectivity employed	☐ ITS G5 ☐ 3G ☐ 4G ☐ LTE-V2X ☐ Other, please specify:
Infrastructure support	Digital infrastructure: ☐ Cameras ☐ HD maps ☐ Other, please specify: Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	Project Apollo, led by Addison Lee with Oxbotica, Nominet, Immense Solutions and DG Cities, will develop and deploy 4 autonomous taxi pilot services, that increase in complexity and distance in Greenwich, London. The project will build on the self-driving technology under development by Oxbotica as part of an existing Government-backed project called 'DRIVEN', combining 6 vehicles from that project with a further 9 new vehicles to provide the 4 pilot customer services: (i) feed North Greenwich Station (ii) a Hub-to-hub (no public transport) service (iii) a restricted on-demand service and (iv) a 'go anywhere in borough service'. Once proven this project will lead to the launch of a public service in 2021 (or sooner) whilst bringing together leading UK organisations and helping strengthen the UK Connected and Autonomous Vehicle supply chain in the emerging global market. Designed to complement existing public transport, the service will be app-based, on demand and based on ride-sharing. The vehicles will be low-emission, designed with the pedestrian in mind and priced at a level to generate demand without impacting other public transport.

1.13 ConVEX (UK)

Connected Vehicle data Exchange	
General description	
Name	Connected Vehicle data Exchange
Short name	ConVEx
Partners/Consortium	Bosch, Jaguar Land Rover, Transport for West Midlands, WMG, Valerann, Synaptiv and Immense Solutions. Interdigital and TSC as subcontractors. £8 million - £4 million grant from Innovate UK via Meridian Cordent – spin out from Interdigital
Location	West Midlands – University of Warwick WMG office London – 160 Old Street, UK But scope is national and international
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☒ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2019 funding for 1 year, then platform expected to run commercially. 10-year business plan has been prepared Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☒ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☐ Road safety ☐ Traffic efficiency ☐ Customer Service ☐ Maintenance/Construction ☒ Other, please specify: Data - relates to all of the above
Use Cases tested	☐ Highway Chauffeur ☐ Automated Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: Data, maybe links to the use cases

Size (e.g. Km, Km²)	N/A
Business model	Data aggregation and platform. Also, support to SMEs in London
Environment	☐ Closed ☐ Open area ☒ Other, please specify: Office
R&D/Industry projects that are/were conducted at this test site/bed	Model is to connect organisations with data to organisations who need it. All types of data are relevant, such as air quality, congestion, weather… Broad spectrum of providers and consumers of data, such as vehicle manufacturers, communications companies Each SM will deliver use case examples: • Immense will provide simulation as a service, modelling West Midlands transport system to determine the effect of implementation of CAVs • Valeran have developed smart road studs, containing solar power and sensors, e.g. congestions, visibility. These are sent to a Gateway and the Gateway links to the data centre • Synaptiv – connected car data linked to pothole detection The Innovate UK competition was about data exchange to support the deployment of CAVs. The consortium took a broad view and felt that there was a need to understand the mobility landscape to see where CAVs are best deployed. This could consider public transport provision, air quality and existing accessibility to mobility. The first step will be to catalogue data sets, then aggregate and processing.

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☒ Inter-Urban ☐ Other, please specify:
Connectivity employed	☐ ITS G5 ☐ 3G ☐ 4G ☐ LTE-V2X ☒ Other, please specify: Could use any of all of the above to collect data; but not the focus of the project
Infrastructure support	Digital infrastructure: ☐ Cameras ☐ HD maps ☒ Other, please specify: N/A Physical infrastructure: ☐ Road markings ☐ Road edges delineation ☒ Other, please specify: N/A
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	The facility is to be headquartered on the WMG campus with a partner office at Bosch's recently announced 'Connectory' facility in London. These two sites align with Meridian's real world connected and automated testbed facilities – Midlands Future Mobility and the Smart Mobility Living Lab: London. The facility will be developed over the course of 2019 with commercial data sharing operations commencing in 2020. The UK Government has awarded over £4 million to a Bosch-led project which will invest a total of £8 million to accelerate the development and deployment of connected and automated vehicles. Bosch is leading a consortium to create a facility for the exchange of data which will be critical to the future of mobility. The investment will enable the UK to capture the benefits of connected and automated vehicles sooner.

1.14 Millbrook Culham Test and Evaluation Environment (UK)

Millbrook Culham Test and Evaluation Environment	
General description	
Name	Millbrook-Culham Test and Evaluation Environment
Short name	MCTEE
Partners/Consortium	Millbrook Test Site, Culham test site
Location	Oxford and West Midlands, UK
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☒ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2018 (fully operational 2019) Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☐ > 5 years ☒ Undefined ☐ Other, please specify:
Business areas	☐ Road safety ☒ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction
Use Cases tested	☒ Highway Chauffeur ☐ Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: Communications testing
Size (e.g. Km, Km²)	70 km Millbrook / 10 km Culham
Business model	Bridge gap between track testing and public roads
Environment	☒ Closed – track trials ☐ Open area ☐ Other, please specify:
Research/Industry projects that were conducted at this test site/bed	CAV, MaaS, Social Impacts

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☐ Motorway ☒ Inter-Urban ☒ Other, please specify: Track
Connectivity employed	☐ ITS G5 ☐ 3G ☐ 4G ☐ LTE-V2X ☒ Other, please specify: 5G
Infrastructure support	Digital infrastructure: ☐ Cameras ☐ HD maps ☐ Other, please specify: Physical infrastructure: ☒ Road markings ☐ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	RACE is teaming up with vehicle testing specialists Millbrook Group to form the Millbrook-Culham Test and Evaluation Environment. This is creating a series of tracks to mimic a range of real-life driving environments where automated vehicles can be put through their paces before going on to public roads. The Millbrook Culham Test and Evaluation Environment collaboration is one of the first four Meridian projects. Meridian is a Government-backed partnership which is described as “the gateway to self-driving vehicle development in the UK”. RACE has use of 10 km of roads on the secure United Kingdom Atomic Energy Authority site at Culham Science Centre in Oxfordshire. The population on site will enable testing to capture human aspects of real-world operation for CAVs, extending to Mobility-as-a-Service (MaaS), in a semi-controlled and safe way. Millbrook has 70 km of test tracks at its proving ground in the UK, offering a diverse topography to replicate urban contexts. The site is already being used for testing a spectrum of CAV technologies, as well as for proving safety, comfort, durability and reliability, from full vehicle to component level. The two sites will offer all-weather, multi-user access and seamless transfers between environments, cost-effectively addressing all functional requirements, both current and future, of any real-world urban scenario.

1.15 Test bed Midlands Future Mobility (UK)

Test bed Midlands Future Mobility	
General description	
Name	Midlands Future Mobility
Short name	Midlands Future Mobility
Partners/Consortium	WMG at University of Warwick, Amey, AVL, Costain, Coventry University, MIRA, Transport for West Midlands, Wireless Infrastructure Group,
Location	West Midlands, UK
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☒ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): TBD Planned duration: ☐ 0 – 2 years ☒ 2 – 5 years ☐ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☒ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☐ Highway Chauffeur ☐ Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: Communications testing
Size (e.g. Km, Km^2)	160 km
Business model	Independent mobility, fewer accidents, reduced congestion, jobs to West Midlands
Environment	☐ Closed – track trials

	☒ Open area – UK Roads ☐ Other, please specify:
Research/Industry projects that were conducted at this test site/bed	

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☒ Inter-Urban ☒ Other, please specify: Rural
Connectivity employed	☐ ITS G5 ☐ 3G ☐ 4G ☐ LTE-V2X ☒ Other, please specify: • ADAS systems; • Autonomous control systems; • Sensors to enable smart infrastructure; • Digital worlds for virtual validation; • Communications systems including 5G
Infrastructure support	Digital infrastructure: ☐ Cameras ☐ HD maps ☐ Other, please specify: Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	This facility will have around 160km of urban, suburban, rural and highways roads for testing and development of connected and autonomous systems.

1.16 Test site Horiba-MIRA TIC-IT (UK)

Test site Horiba-MIRA TIC-IT	
General description	
Name	Horiba-MIRA TIC-IT
Short name	TIC-IT
Partners/Consortium	Horiba-MIRA Test Site, Coventry University, funding from Innovate UK
Location	West Midlands, UK
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☒ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2017 launched Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☒ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☒ Traffic efficiency ☒ Customer Service ☒ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☒ Highway Chauffeur ☒ Shuttle bus ☒ Freight Vehicles platooning ☒ Driverless maintenance and road works vehicles ☒ Other, please specify: Test bed – potentially all
Size (e.g. Km, Km²)	2 km currently
Business model	Government funding to place UK as world leader
Environment	☒ Closed – track trials ☐ Open area ☐ Other, please specify:

Research/Industry projects that were conducted at this test site/bed	Planning approved

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☐ Motorway ☒ Inter-Urban ☒ Other, please specify: Track
Connectivity employed	☐ ITS G5 ☐ 3G ☐ 4G ☐ LTE-V2X ☒ Other, please specify: • IEEE 802.11a/b/g/n (Wi-Fi) • IEEE 802.11p (5.9GHz band allocated for V2V and V2I in Europe and North America) • GSM/GPRS/3G cellular network • Ground truth positioning (3D motion capture system) • RTK-GPS • GNSS denial • NOW Wireless Mesh 4G • Centralised control system
Infrastructure support	Digital infrastructure: ☐ Cameras ☐ HD maps ☐ Other, please specify: Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	

1.17 Test bed Colas IPV (UK)

Test bed Colas Impact Protection Vehicle	
General description	
Name	Colas Impact Protection Vehicle
Short name	Colas IPV
Partners/Consortium	Colas
Location	N/A
Type of ownership (e.g. NRA involvement)	☐ Public ☒ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2017 launched Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☒ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☐ Traffic efficiency ☐ Customer Service ☒ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☐ Highway Chauffeur ☐ Shuttle bus ☐ Freight Vehicles platooning ☒ Driverless maintenance and road works vehicles ☐ Other, please specify:
Size (e.g. Km, Km²)	N/A
Business model	Sales of vehicles, awarding of contracts
Environment	☒ Closed – Track trials ☐ Open area ☒ Other, please specify: Soon moving to road trials
Research/Industry projects that were conducted at this test site/bed	Autonomous impact protection vehicle for cone laying

Technical characteristics (please check and specify, all which applies)	
Type of environment	☐ Urban ☒ Motorway ☐ Inter-Urban ☐ Other, please specify:
Connectivity employed	☐ ITS G5 ☐ 3G ☐ 4G ☐ LTE-V2X ☒ Other, please specify: • DSRC, • V2X
Infrastructure support	Digital infrastructure: ☐ Cameras ☐ HD maps ☐ Other, please specify: Physical infrastructure: ☐ Road markings ☐ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	

1.18 Brainport Pilot Site (the Netherlands)

Brainport Pilot Site	
General description	
Name	Brainport
Short name	Brainport
Partners/Consortium	Siemens, KPN, TNO, Tue, Dynnig, Province of North Brabant, Rijkswaterstaat, City of Helmond, City of Einhoven
Location	South-East Netherlands
Type of ownership (e.g. NRA involvement)	☒ Public ☒ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2010 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☐ > 5 years ☒ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☒ Traffic efficiency ☐ Customer Service ☐ Maintenance/Construction ☒ Other, please specify: Automated Driving
Use Cases tested	☒ Highway Chauffeur ☐ Automated Shuttle bus ☒ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: • Passenger car C-ACC • Cooperative Collision Avoidance • Green light optimal speed advisory • Red light violation warning • Automated Valet parking • Teleoperations • Roadside assisted Automated Driving
Size (e.g. Km, Km²)	20 km

Business model	Collaborative use in Dutch and EU project Commercial service offerings
Environment	☐ Closed ☒ Open area ☒ Other, please specify: The roads can be closed for specific experiments
R&D/Industry projects that are/were conducted at this test site/bed	5G-MOBIX, AUTOPILOT, Concorda, C-MOBILE, Intercor, Maven, Timon, Co-Exist, Vidas, Hights, SECREDAS, DRIVE C2X, VRUITS, SPITS… (and more)

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☒ Inter-Urban ☒ Other, please specify: Business area
Connectivity employed	☒ ITS G5 ☒ 3G ☒ 4G ☒ LTE-V2X ☒ Other, please specify: Pre-5G
Infrastructure support	Digital infrastructure: ☒ Cameras ☒ HD maps ☒ Other, please specify: • Traffic light controllers and information • Radars Physical infrastructure: ☒ Road markings ☐ Road edges delineation ☒ Other, please specify: Public road, no specific measures taken
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	Other elements: • Urban area with signalized intersections with vulnerable road users • Industrial area with parking lots • Interurban area with signalized intersections • Highway with on and off ramps. Full coverage of all relevant areas with ITS G5, pre-5G cellular network, fiber network, automatic real-time vehicle tracking, and RTK-base station. Private cloud for data logging, processing, and visualisation, and for service deployment.

1.19 ZalaZONE (Hungary)

ZalaZONE Automotive Proving Ground	
General description	
Name	ZalaZONE Automotive Proving Ground
Short name	ZalaZONE
Partners/Consortium	Budapest University of Technology and Economics (BME)
Location	46.889424, 16.826643 Project office: Fészek utca 4. Zalaegerszeg 8900 Hungary
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☐ PPT – joint ☒ Other, please specify: State-owned
Lifespan (past and future planned activities)	Start of operation (year): 2019 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☒ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☒ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction ☐ Other, please specify:
Use Cases to be tested	☒ Highway Chauffeur ☒ Automated Shuttle bus ☒ Freight Vehicles platooning ☒ Driverless maintenance and road works vehicles ☐ Other, please specify:
Size (e.g. Km, Km²)	265 ha (2.65 km²)
Business model	Testing infrastructure available for industrial and public R&D usage
Environment	☒ Closed

	☐ Open area ☐ Other, please specify:
R&D/Industry projects that are/were conducted at this test site/bed	RECAR, EFOP 3.6.2./3.6.3, FIKP, CEEPUS (in 2019 summer)

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☒ Inter-Urban ☒ Other, please specify: • Classical vehicle dynamic areas (Dynamic platform, Braking platform, Handling course)
Connectivity employed (planned)	☒ ITS G5 ☒ 3G ☒ 4G ☒ LTE-V2X ☒ Other, please specify: 5G
Infrastructure support	Digital infrastructure (planned): ☒ Cameras ☒ HD maps ☒ Other, please specify: • Drones, • Slow-motion cameras Physical infrastructure (finished): ☒ Road markings ☒ Road edges delineation ☒ Other, please specify: • Facade, • Bus stop, safety islands, • Parking cars, parking plots, • Logistic yard, • Different road side objects,
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	Planned in 2019: T-junction area, 3 level parking house; Open-air parking with variable parking plots, Logistic yard with different docking, Railway crossing, Raining system, Guided pedestrian and vehicle soft target dummies

1.20 Test bed Trikala (Greece)

Test bed Trikala	
General description	
Name	[FP7-SST-2012-RTD-1 GA: 314190] Cities demonstrating cybernetic mobility – CityMobil2, Trikala large scale pilot
Short name	CM2 Trikala pilot
Partners/Consortium	Coordinator: UNIVERSITA DEGLI STUDI DI ROMA LA SAPIENZA (M1-M36), UNIVERSITA DEGLI STUDI DI FIRENZE (M37-M48) Greek partners: ANAPTYXIAKI ETAIREIA DIMOU TRIKKAION ANAPTYXIAKI ANONYMI ETAIREIA OTA - E-TRIKALA AE, INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS 45 more EU partners
Location	Trikala, Greece
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☒ PPT – joint ☐ Other, please specify: The FP7 project “CityMobil2” was co-funded by the Greek Ministry of Transport and the Greek Ministry of Digital Policy
Lifespan (past and future planned activities)	Start of operation (year): September 2015 Planned duration: ☒ 0 – 2 years ☐ 2 – 5 years ☐ > 5 years ☐ Undefined ☒ Other, please specify: New pilot to run under National GSRT-funded project “AVINT” in another pre-identified larger route mixing urban and sub-urban area.
Business areas	☒ Road safety ☒ Traffic efficiency ☐ Customer Service ☒ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☐ Highway Chauffeur ☒ Automated Shuttle bus

	☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☐ Other, please specify:
Size (e.g. Km, Km²)	CityMobil2 project (http://citymobil2.eu/) demonstrated in Trikala the automated transportation of six driverless electric vehicles in the city centre in a 2.8 km circular route. 1,490 independent driverless trips were conducted, 3,580 km distance was covered and 12,138 passengers were on board in total.
Business model	Six automated driverless electrical vehicles were provided by manufacturer “Robosoft”, co-partner of the project and thus no expenses regarding leasing or renting were conducted by the pilots, since Robosoft was responsible to provide its vehicles under rotation in each pilot at a time (other pilots of CM2 were provided vehicles by the second manufacturer, “EasyMile”). Trikala pilot was responsible to cover operational costs (electricity charging costs, infrastructure maintenance costs, telecommunication costs, human effort costs, etc) within the scope and under FP7 grant. In specific, the demonstration category of costs was financed by 50% by EU under FP7 and the rest 50% was co-financed by its vast percentage by the Greek Ministry of Transport and the rest percentage by the Greek Ministry of Digital Policy. Other categories of costs (administrative, managerial, other) were less significant and were covered by EU either by 100% or by 75% (with the corresponding 25% to be covered by the Greek Ministries). The usage for the passengers was free of charge, while a willingness to pay survey had been contacted.
Environment	☐ Closed ☒ Open area ☐ Other, please specify:
R&D/Industry projects that are/were conducted at this test site/bed	CM2 was the first such pilot conducted ever not only in the region but also in Greece in general. Given that it operated more than 3 years ago within the city center in mixed traffic mode with mild intervention, it is regarded as a pioneer of its kind and a global benchmark.

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☐ Motorway ☐ Inter-Urban ☐ Other, please specify:
Connectivity employed	☐ ITS G5 ☐ 3G ☒ 4G ☒ LTE-V2X ☐ Other, please specify:
Infrastructure support	Digital infrastructure: ☒ Cameras ☐ HD maps ☐ Other, please specify: Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	Green wave effect on traffic light intersections 20 km/h speed limit Mixed traffic mode operation After the end of the pilot, the route was turned to a dedicated bicycle lane

1.21 TRANSPOLIS (France)

TRANSPOLIS	
General description	
Name	TRANSPOLIS
Short name	TRANSPOLIS
Partners/Consortium	14 stakeholders in 2018 (ADETEL GROUP, AIXAM, BERTHELET, CAISSE DES DEPOTS ET CONSIGNATIONS, COLAS, EVE SYSTEM, FEDERATION FRANCAISE DE LA CARROSSERIE, GROUPAMA RHONE-ALPES AUVERGNE, HIKOB, IFSTTAR, RENAULT TRUCKS, SYNDICAT DES EQUIPEMENTIERS DE LA ROUTE, VIBRATEC, VICAT) and with the financial support of other public actors (DGE, REGION AUVERGNE RHONE-ALPES, DEPARTEMENT DE L'AIN, COMMUNAUTE DE COMMUNES DE LA PLAINE DE L'AIN, METROPOLE DE LYON).
Location	620 Route des Fromentaux - 01500 Saint-Maurice-de-Rémens - FRANCE 01360 Béligneux - France
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☒ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2018 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☒ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☒ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☒ Highway Chauffeur ☒ Automated Shuttle bus ☒ Freight Vehicles platooning

	☐ Driverless maintenance and road works vehicles ☐ Other, please specify:
Size (e.g. Km, Km²)	0.8 km²
Business model	Test services
Environment	☒ Closed ☐ Open area ☐ Other, please specify:
R&D/Industry projects that were conducted at this test site/bed	

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☒ Inter-Urban ☒ Other, please specify: rural roads
Connectivity employed	☒ ITS G5 ☒ 3G ☒ 4G ☒ LTE-V2X ☐ Other, please specify:
Infrastructure support	Digital infrastructure: ☒ Cameras ☐ HD maps ☐ Other, please specify: Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☐ Other, please specify: • Industrial LAN (fiber optical network), • Crash-test areas
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	

1.22 SISCOGA4CAD (Spain)

SIStemas COoperativos Galicia for Cooperative and Autonomous Driving	
General description	
Name	SIStemas COoperativos GAlicia for Cooperative and Autonomous Driving
Short name	SISCOGA4CAD
Partners/Consortium	CTAG, DGT (Spanish Ministry of Traffic), Concello de Vigo (Council of Vigo)
Location	Vigo area (Galicia, Spain)
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☐ PPT – joint ☒ Other, please specify: Mixed
Lifespan (past and future planned activities)	Start of operation (year): 2010 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☐ > 5 years ☐ Undefined ☒ Other, please specify: Permanent
Business areas	☒ Road safety ☒ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction ☒ Other, please specify: Autonomous Driving Support
Use Cases tested	☐ Highway Chauffeur ☐ Automated Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: • C-ITS DAY 1 services, • Autonomous Driving support application (based on C-ITS)

Size (e.g. Km, Km²)	CTAG test track, more than 150 Km of high capacity public roads (A55, A52, AP9) around Vigo area and 80 urban intersections in Vigo city
Business model	Permanent corridor to allow test and validation of most relevant C-ITS services and their application in Connected and Automated Driving
Environment	☒ Closed ☒ Open area ☐ Other, please specify:
R&D/Industry projects that were conducted at this test site/bed	DRIVE C2X, COMPASS4D, CO-GISTICS, SCOOP@F X tests, C-ROADS, AUTOPILOT, …

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☐ Inter-Urban ☒ Other, please specify: Test track also available
Connectivity employed	☒ ITS G5 ☒ 3G ☒ 4G ☒ LTE-V2X ☐ Other, please specify:
Infrastructure support	Digital infrastructure: ☒ Cameras ☒ HD maps ☐ Other, please specify: Physical infrastructure: ☐ Road markings ☐ Road edges delineation ☒ Other, please specify: • VMS, • Inductive Loops, • Advanced Weather Stations
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	The corridor includes 4 tunnels, 3 toll areas and one of the Spanish road stretches with a major number of accidents in the inter-urban area; the major streets of the most populated Galician city covered with C-ITS and a test track to pre-test and pre-validate the C-ITS services to be deployed in real environments.

1.23 Catalonia Living Lab (Spain)

Catalonia Living Lab	
General description	
Name	Catalonia Living Lab
Short name	CLL
Partners/Consortium	Government of Catalonia, Catalan Traffic Service, Cluster of Catalan Automotive Industry, Barcelona City Council, Mobile World Capital Barcelona, SEAT, NISSAN, FICODA, Applus IDIADA, Parcmotor Castelloli, Campus Motor Anoia, Lleida Airport, Circuit de Catalunya, Aurora Test Ecosystem, Cellnex Telecom, Sensefields, Institut de Robotica I Informatica Industrial, Centre for Computer Vision, Abertis Autopistas, Saba Car Parks, Catalan Automobile Club, CarNET
Location	Catalonia, Spain
Type of ownership (e.g. NRA involvement)	☒ Public ☒ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2016 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☒ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☐ Road safety ☐ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction ☒ Other, please specify: Development and testing of connected and automated vehicles
Use Cases tested	☒ Highway Chauffeur ☒ Automated Shuttle bus ☒ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: • ADAS systems (up to SAE 3)

	• Near future: highly automated vehicles (SAE 3, 4, 5)
Size (e.g. Km, Km²)	Four Proving Grounds with a total surface of 7.7 km² Catalan public road network with total length of 12.063 km (not counting urban areas)
Business model	Project based service providing by consortium members to international automotive industry
Environment	☒ Closed ☒ Open area ☒ Other, please specify: • Virtual simulators, • Laboratories and engineering offices
R&D/Industry projects that are/were conducted at this test site/bed	EU funded: C-ROADS, INFRAMIX, C-MOBILE, ENSEMPLE PLATOONING, COMPANION PLATOONING, ADAS&ME, GCDC i-GAME; NEXTTECH (consortium funded) SEAT Autonomous Driving Challenge ERICA Amtu project *For confidentiality reasons, CAV related projects with manufacturers and suppliers cannot be provided.*

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☒ Inter-Urban ☒ Other, please specify: rural, parking, virtual simulation, laboratories and engineering offices
Connectivity employed	☒ ITS G5 ☒ 3G ☒ 4G ☒ LTE-V2X ☒ Other, please specify: WiFi 802.11p, DSRC
Infrastructure support	Digital infrastructure: ☒ Cameras ☒ HD maps ☒ Other, please specify: • VMS, • Traffic and data management systems Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☒ Other, please specify: • Safety barriers • Confidentiality fencing • Moveable and adjustable traffic signs and street lighting • D-GPS positioning systems (roadside) • Conduits and manholes for electricity and Ethernet cables • Charging stations for EVs Near future: placement of roadside sensors, systems for mobile edge computing (MEC) and RSUs
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	Cross-border testing, on-site workshops for vehicle adjustments and test management, public road inventory software allowing for quick identification for certain road furniture and planification of test routes for CAVs, temporarily closing off certain road sections for CAV testing.

1.24 IDIADA Proving Ground (Spain)

IDIADA Proving Ground	
General description	
Name	IDIADA Proving Ground
Short name	IDIADA PG
Partners/Consortium	IDIADA Automotive Technology, S.A.
Location	Santa Oliva – Tarragona (SPAIN)
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☒ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 1994 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☒ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☒ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☒ Highway Chauffeur ☒ Automated Shuttle bus ☒ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☐ Other, please specify:
Size (e.g. Km, Km²)	15 km (general road + PAV + dry handling)
Business model	Project based service providing by consortium members to international automotive industry
Environment	☒ Closed ☐ Open area ☐ Other, please specify:

R&D/Industry projects that are/were conducted at this test site/bed	COMPANION, i-Game, ENSEMBLE, PROSPECT, SARTRE *For confidentiality reasons, CAV related projects with manufacturers and suppliers cannot be provided.*

Technical characteristics (please check and specify, all which applies)	
Type of environment	☐ Urban ☒ Motorway ☒ Inter-Urban ☐ Other, please specify:
Connectivity employed	☒ ITS G5 ☒ 3G ☒ 4G ☐ LTE-V2X ☒ Other, please specify: D-GPS corrections
Infrastructure support	Digital infrastructure: ☐ Cameras (on demand) ☒ HD maps ☐ Other, please specify: Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	Intersection test track opening in 2019 Q3. Variable speed according to test track and type of test ETSI ITS G5 RSUs deployed to provide full coverage to proving ground Driving simulator available to clients in 2019 Q3.

1.25 Test site Stockholm (Sweden)

Test Site Stockholm	
General description	
Name	Test Site Stockholm
Short name	TSS
Partners/Consortium	KTH, Ericsson, Nobina, 4Dialog, Stockholms Stad, Scania
Location	Kista, Stockholm
Type of ownership (e.g. NRA involvement)	☐ Public ☒ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☐ > 5 years ☐ Undefined ☒ Other, please specify: It is a test bed with connectivity and other assets for temporary or long-term tests.
Business areas	☒ Road safety ☒ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction ☒ Other, please specify: Connectivity
Use Cases tested	☐ Highway Chauffeur ☒ Automated Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: Vehicles connected to control tower, including remote operation.
Size (e.g. Km, Km^2)	About 2 km long roads in a small network
Business model	
Environment	☐ Closed ☒ Open area

	☐ Other, please specify:
R&D/Industry projects that were conducted at this test site/bed	Autopiloten (January – June 2018), many shorter tests to try specific technology

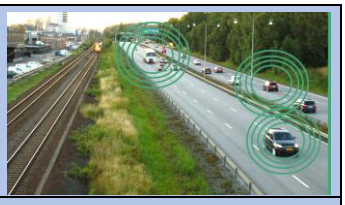
Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☐ Motorway ☐ Inter-Urban ☐ Other, please specify:
Connectivity employed	☐ ITS G5 ☐ 3G ☒ 4G ☐ LTE-V2X ☒ Other, please specify: 5G
Infrastructure support	Digital infrastructure: ☐ Cameras ☒ HD maps ☒ Other, please specify: • Extensive connectivity incl. 5G • Control tower architecture • 3D maps of environment • Connected traffic lights • “Smart” bus stop. Physical infrastructure: ☐ Road markings ☐ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	Mixed traffic.

1.26 MMiB (Sweden)

Modern Mobility in Barkarbystaden	
General description	
Name	Modern Mobility in Barkarbystaden
Short name	MMiB
Partners/Consortium	Nobina, KTH, Järfälla kommun, Trafikförvaltningen Region Stockholm
Location	Barkarby, Järfälla kommun
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☒ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2018 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☒ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☐ Road safety ☒ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☐ Highway Chauffeur ☒ Automated Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☐ Other, please specify:
Size (e.g. Km, Km^2)	Currently 2 km, expansions are planned
Business model	Vinnova-grant plus in-kind from partners
Environment	☐ Closed ☒ Open area ☐ Other, please specify:
R&D/Industry projects that were conducted at this test site/bed	

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☐ Motorway ☐ Inter-Urban ☐ Other, please specify:
Connectivity employed	☐ ITS G5 ☐ 3G ☒ 4G ☐ LTE-V2X ☐ Other, please specify:
Infrastructure support	Digital infrastructure: ☐ Cameras ☐ HD maps ☐ Other, please specify: Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	

1.27 TSS-W (Sweden)

Test Site Sweden-West 	
General description	
Name	Test Site Sweden- West
Short name	TSS-W
Partners/Consortium	Lindholmen Science Park/Innovatum
Location	Sweden
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☐ PPT – joint ☒ Other, please specify: A project funded by EU's regional fund and Västra Götaland region
Lifespan (past and future planned activities)	Start of operation (year): 2016-2018 Planned duration: ☐ 0 – 2 years ☒ 2 – 5 years ☐ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☐ Road safety ☐ Traffic efficiency ☐ Customer Service ☐ Maintenance/Construction ☒ Other, please specify: Transport sector in general
Use Cases tested	☐ Highway Chauffeur ☐ Automated Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: Not applicable
Size (e.g. Km, Km^2)	
Business model	3-year project, funded by EU's regional fund and Västra Götaland region
Environment	☐ Closed ☒ Open area

	☐ Other, please specify:
R&D/Industry projects that were conducted at this test site/bed	See webpage for more info https://www.testsitesweden.com/West

Technical characteristics (please check and specify, all which applies)	
Type of environment	☐ Urban ☐ Motorway ☐ Inter-Urban ☒ Other, please specify: Not applicable
Connectivity employed	☐ ITS G5 ☐ 3G ☐ 4G ☐ LTE-V2X ☒ Other, please specify: Not applicable
Infrastructure support	Digital infrastructure: ☐ Cameras ☐ HD maps ☒ Other, please specify: Physical infrastructure: ☐ Road markings ☐ Road edges delineation ☒ Other, please specify: Not applicable
Other specific characteristics (e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)	Cluster function to facilitate test environments/projects in Västra götaland region.

1.28 AstaZero (Sweden)

AstaZero AB	

General description	
Name	AstaZero AB
Short name	AstaZero
Partners/Consortium	Owners are RISE and Chalmers University of Technology
Location	Gothenburg and Borås Sweden
Type of ownership (e.g. NRA involvement)	☒ Public ☐ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2014 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☐ > 5 years ☒ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☐ Traffic efficiency ☐ Customer Service ☐ Maintenance/Construction ☒ Other, please specify: Automated and connected mobility
Use Cases tested	☒ Highway Chauffeur ☒ Automated Shuttle bus ☒ Freight Vehicles platooning ☒ Driverless maintenance and road works vehicles ☒ Other, please specify: Focus on active safety, automated and/or connected vehicles
Size (e.g. Km, Km²)	350 Ha (3.5 km²)
Business model	Common pricelist
Environment	☒ Closed ☐ Open area

	☐ Other, please specify:
R&D/Industry projects that were conducted at this test site/bed	R&D projects from the industry (vehicle and supplier), academic/institute research projects, collaboration projects with several actors and stakeholders within the area of future mobility.

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☒ Inter-Urban ☒ Other, please specify: High speed area for flexible testing
Connectivity employed	☐ ITS G5 ☐ 3G ☒ 4G ☒ LTE-V2X ☒ Other, please specify: • LTE advanced • 5G
Infrastructure support	Digital infrastructure: ☒ Cameras ☒ HD maps ☐ Other, please specify: Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☒ Other, please specify: • Lighting • Traffic signs • Target vehicles (such as balloon cars) • Pedestrian dummies (adult, child) • Bikes, moose.
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	Roundabouts, intersections of different kinds, bus stops, garage facilities, conferencing facilities Virtual representations of all tracks are available.

1.29 AURORA (Finland)

Arctic Intelligent Transport Ecosystem	aurora snowbox.fi
General description	
Name	E8 Aurora, the Arctic intelligent transport test ecosystem
Short name	AURORA
Partners/Consortium	managed by The Finnish Transport Agency
Location	Main Road 22 in Finnland; public road test section from Pahtonen to Muonio that is instrumented to support especially connected and automated driving trials in real traffic
Type of ownership (e.g. NRA involvement)	☒ Public ☐ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2017 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☐ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☐ Traffic efficiency ☐ Customer Service ☒ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☐ Highway Chauffeur ☐ Shuttle bus ☐ Freight Vehicles platooning ☒ Driverless maintenance and road works vehicles ☒ Other, please specify: • Automated winter driving, • Proactive winter maintenance • Cross-border testing of connected and automated driving
Size (e.g. Km, Km²)	10 km
Business model	

Environment	☐ Closed ☒ Open area ☐ Other, please specify:
Research/Industry projects that were conducted at this test site/bed	

Technical characteristics (please check and specify, all which applies)	
Type of environment	☐ Urban ☒ Motorway ☐ Inter-Urban ☐ Other, please specify:
Connectivity employed	☒ ITS G5 ☒ 3G ☒ 4G ☒ LTE-V2X ☐ Other, please specify:
Infrastructure support	Digital infrastructure: ☐ Cameras ☒ HD maps ☐ Other, please specify: Physical infrastructure: ☐ Road markings ☐ Road edges delineation ☒ Other, please specify: • Precise positioning 1-5 cm precision using GNSS receivers • Data collected from the sensors and equipment available as open data • Instrumentation supporting intelligent infrastructure asset management trials.
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	

1.30 Millbrook (Finland and UK)

Millbrook Proving Ground and Test World	TEST WORLD A MILLBROOK GROUP COMPANY
General description	
Name	Millbrook Proving Ground and Test World
Short name	Millbrook
Partners/Consortium	N/A
Location	UK and Finland
Type of ownership (e.g. NRA involvement)	☐ Public ☒ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 1970 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☐ > 5 years ☐ Undefined ☒ Other, please specify: Continuous
Business areas	☒ Road safety ☒ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction ☒ Other, please specify: Test services
Use Cases tested	☐ Highway Chauffeur ☐ Automated Shuttle bus ☒ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: Connected and Autonomous Vehicles in general. Specific use cases are confidential.
Size (e.g. Km, Km^2)	Millbrook UK: 283 Ha (2.83 km^2); Testworld Finland: 1120 Ha (11.2 km^2).
Business model	Independent and Impartial Test Services and Certification
Environment	☒ Closed ☐ Open area ☐ Other, please specify:

R&D/Industry projects that are/were conducted at this test site/bed	Many and varied. UK Government Official Controlled Urban CAV Testbed and 5G Transport testbed.

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☒ Inter-Urban ☒ Other, please specify: • Rural • Off road, ice and snow conditions
Connectivity employed	☒ ITS G5 ☒ 3G ☒ 4G ☒ LTE-V2X ☒ Other, please specify: • 5GNR 3.5Ghz, mmWave 60GHz, 70GHz • 4G LTE 2.3GHz and 3.6GHz private network
Infrastructure support	Digital infrastructure: ☒ Cameras ☒ HD maps ☒ Other, please specify: Full digital model of all tracks Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☒ Other, please specify: Full range of highway conditions
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	Connectivity: 59 Masts/ 100 radio sets. Hyper Dense Cellular small cell 5G Transport testbed. Highly configurable physical infrastructure for highways and roads. Customisable road circuits. Indoor and outdoor winter testing environments, giving 12 months snow and ice testing capability in Finland.

1.31 BOREALIS (Norway)

Test Ecosystem for cross-border testing with Finland	
General description	
Name	Borealis, test ecosystem for cross border testing with Finland
Short name	BOREALIS
Partners/Consortium	managed by Norwegian Public Roads Agency (NPRA)
Location	Kilpisjärvi border area towards Skibotn Valley in Norway
Type of ownership (e.g. NRA involvement)	☒ Public ☐ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2017 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☐ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☐ Traffic efficiency ☐ Customer Service ☒ Maintenance/Construction
Use Cases tested	☐ Highway Chauffeur ☐ Shuttle bus ☐ Freight Vehicles platooning ☒ Driverless maintenance and road works vehicles ☒ Other, please specify: • ITS test bed • Safety of heavy duty vehicles • Cross-border testing of connected and automated driving
Size (e.g. Km, Km²)	40 km
Business model	
Environment	☐ Closed ☒ Open area

	☐ Other, please specify:
Research/Industry projects that were conducted at this test site/bed	

Technical characteristics (please check and specify, all which applies)	
Type of environment	☐ Urban ☒ Motorway ☐ Inter-Urban ☐ Other, please specify:
Connectivity employed	☐ ITS G5 ☐ 3G ☐ 4G ☐ LTE-V2X ☐ Other, please specify:
Infrastructure support	Digital infrastructure: ☐ Cameras ☐ HD maps ☒ Other, please specify: • Real-time information about the weather • Road surface conditions and traffic accidents • Automatic scanning of the vehicle's brakes • Warnings of wildlife or other obstacles on the roadway. Physical infrastructure: ☐ Road markings ☐ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	

1.32 AV-PL-ROAD (Poland)

Polish Road to Automation of Road Transport	
General description	
Name	Polish Road to Automation of Road Transport
Short name	AV-PL-ROAD
Partners/Consortium	Ministry of Infrastructure, Motor Transport Institute, Warsaw University of Technology
Location	Southern Poland
Type of ownership (e.g. NRA involvement)	☒ Public ☐ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): in planning Planned duration: ☐ 0 – 2 years ☒ 2 – 5 years ☐ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☐ Traffic efficiency ☐ Customer Service ☐ Maintenance/Construction
Use Cases tested	☐ Highway Chauffeur ☐ Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: L1-L3 systems installed in the most popular, commercially available passenger vehicles in Poland. The systems will be tested upon the compliance with the characteristics of Polish road infrastructure and their high-level road safety increase potential
Size (e.g. Km, Km^2)	The tests are planned to be taken on a test track (most probably a 1-1.5 km former airfield strip) as well as in naturalistic conditions
Business model	The test results will serve as an input for the recommendations to the legal changes regarding the use of driving automation systems in Poland.

Environment	☒ Closed ☐ Open area ☐ Other, please specify:
Research/Industry projects that were conducted at this test site/bed	-

Technical characteristics (please check and specify, all which applies)	
Type of environment	☐ Urban ☐ Motorway ☐ Inter-Urban ☒ Other, please specify: At this stage of the project it is yet hard to assume. The final decision will be made upon the testing requirements and legal restrictions
Connectivity employed	☐ ITS G5 ☐ 3G ☐ 4G ☐ LTE-V2X ☐ Other, please specify:
Infrastructure support	Digital infrastructure: ☒ Cameras ☐ HD maps ☒ Other, please specify: D-GPS station, automated moving platform Physical infrastructure: ☒ Road markings ☐ Road edges delineation ☒ Other, please specify: • Road signs • balloon vehicles and balloon VRUs
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	

1.33 Virginia Smart Roads (USA)

Virginia Smart Roads	
General description	
Name	Virginia Smart Roads
Short name	N/A
Partners/Consortium	Virginia Tech Transportation Institute and the Virginia Department of Transportation
Location	Blacksburg, Virginia, United States of America
Type of ownership (e.g. NRA involvement)	☒ Public ☐ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2000 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☒ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☒ Traffic efficiency ☐ Customer Service ☒ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☒ Highway Chauffeur ☒ Automated Shuttle bus ☐ Freight Vehicles platooning ☒ Driverless maintenance and road works vehicles ☒ Other, please specify: • Urban automation (beyond LSAV) • Many ADAS tests at all levels with varying automated capabilities
Size (e.g. Km, Km^2)	Currently growing this year. At completion, the environment will have approximately 10,5 km of paved roadway and substantially more unpaved off-road trails.
Business model	Supports research endeavours of VTTI and our partners. Facility is available for a fee; however, generally it is part of a service model with VTTI faculty involved directly with the research.

Environment	☒ Closed ☐ Open area ☐ Other, please specify:
R&D/Industry projects that were conducted at this test site/bed	Over 25,000 hours of research on this facility. Listing all automation related activities would be a challenge as we work every day across the automation continuum using the Virginia Smart Roads. Broadly speaking, we work directly with various automobile manufactures, technology companies, and road operators to create safe and effective automated vehicle systems

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☒ Inter-Urban ☒ Other, please specify: We also have rural sections, from old windy rural roads to unpaved sections and off-road trails.
Connectivity employed	☒ ITS G5 ☒ 3G ☒ 4G ☒ LTE-V2X ☒ Other, please specify: 802,11 (a-ac)
Infrastructure support	Digital infrastructure: ☒ Cameras ☒ HD maps ☐ Other, please specify: Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☒ Other, please specify: All standard roadway elements, as these roads are built to full VDOT specifications.
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	The Virginia Smart Roads facility is built to represent actual roadways classified as Interstate, urban/suburban, and rural. Thus, it has all infrastructure one would expect from functional roads – from traffic control devices (signs to signals) to bridges and guardrails. We have a variety of connectivity options including a full fibre optic network, various wireless access points, full RTK differential GPS systems, overhead gantries, smart roadway lighting systems, weather making equipment (rain, snow, fog), bridges, streams, lakes, adjacent building structures, and various apparatus to create traffic scenarios of virtually all types (e.g. robotic pedestrians, soft targets, etc).

1.34 VAC and VCC (USA)

Virginia Automated Corridor and the Virginia Connected Corridor	
General description	
Name	Virginia Automated Corridor and the Virginia Connected Corridor
Short name	VAC and VCC
Partners/Consortium	Virginia Tech Transportation Institute and the Virginia Department of Transportation are they key partnership.
Location	Northern Virginia, United States of America
Type of ownership (e.g. NRA involvement)	☒ Public ☐ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2015 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☒ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☒ Traffic efficiency ☒ Customer Service ☒ Maintenance/Construction ☒ Other, please specify: Operations
Use Cases tested	☒ Highway Chauffeur ☐ Automated Shuttle bus ☒ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☐ Other, please specify:
Size (e.g. Km, Km^2)	The region size is not precisely defined, as components are available state wide (e.g. ability to operate automated vehicles, cellular based connectivity and cloud access, etc). However, DSRC coverage is available for approximately 20 miles on I-66, 10 miles on I-495 for a total 30 miles on freeway.

	We have arterial coverage on 3.5 miles Rt7, 4.5 miles Rt 50, 4 miles rt29 and 4.6 miles of gallows rd for a total of 16.6 miles arterial. It is likely all of these estimates will increase as the deployment continues to expand.
Business model	Provides early test and evaluation of connected and automated vehicle systems on live roadways (living laboratory approach). Primary customer is VDOT; however, we support the USDOT and some automotive manufactures within this environment as well.
Environment	☐ Closed ☐ Open area ☒ Other, please specify: Live roadways in full operation
R&D/Industry projects that were conducted at this test site/bed	FHWA conducted heavy vehicle platooning projects on this testbed. VTTI has worked with VDOT on a variety of connected vehicle applications which are intended to support increasing levels of automation. We have built and demonstrated a full connected automated vehicle operating on a portion of the roadway, complete with various scenarios in which the AV performance was improved with connectivity. We have worked with automobile consortium to develop and evaluate new connected vehicle data messages with an eye on future use in automated systems.

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☒ Inter-Urban ☒ Other, please specify: Includes some rural areas, though focus is on motorway and intra-urban areas.
Connectivity employed	☒ ITS G5 ☒ 3G ☒ 4G ☐ LTE-V2X ☐ Other, please specify:
Infrastructure support	Digital infrastructure: ☒ Cameras ☒ HD maps ☐ Other, please specify: Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☒ Other, please specify: All standard roadway elements as these roads are active
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	As an open real working roadway region, the VAC/VCC has all infrastructure one would expect from functional roads – from traffic control devices (signs to signals) to bridges and guardrails. We also have over 50 roadside units across intersection and expressway locations as well as RTK GPS corrections over a large region of Northern Virginia.

1.35 Mcity Test Facility (USA)

Mcity Test Facility	
General description	
Name	Mcity Test Facility
Short name	Mcity
Partners/Consortium	60-member companies + University of Michigan.
Location	Ann Arbor, Michigan
Type of ownership (e.g. NRA involvement)	☒ Public ☐ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2015 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☒ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☒ Traffic efficiency ☐ Customer Service ☐ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☐ Highway Chauffeur ☒ Automated Shuttle bus ☐ Freight Vehicles platooning ☒ Driverless maintenance and road works vehicles ☒ Other, please specify: General connected / automated vehicle testing
Size (e.g. Km, Km²)	Approx. 12.14 Ha (0.12 km²)
Business model	Fee recovery for operating expenses
Environment	☒ Closed ☐ Open area ☐ Other, please specify:

R&D/Industry projects that are/were conducted at this test site/bed	The projects are largely confidential, but see for example https://mcity.umich.edu/how-to-launch-a-driverless-shuttle-u-michigan-shares-insights-in-new-case-study/

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☒ Inter-Urban ☐ Other, please specify:
Connectivity employed	☐ ITS G5 ☒ 3G ☒ 4G ☒ LTE-V2X ☒ Other, please specify: • 5G • DSRC
Infrastructure support	Digital infrastructure: ☒ Cameras ☒ HD maps ☒ Other, please specify: Real-time point cloud Physical infrastructure: ☒ Road markings ☒ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	See GIS layer map: https://drive.google.com/open?id=1aXvVZt3EuRgEmqOZznkzgxJ1ese3ZAqj&usp=sharing

1.36 ICVP (Australia)

Ipswich Connected Vehicle Pilot	
General description	
Name	Ipswich Connected Vehicle Pilot
Short name	ICVP
Partners/Consortium	Queensland Transport and Main Roads, Queensland University of Technology, Motor Accident Insurance Commission (MAIC) Vendors/Suppliers: Kapsch, Codha, Amazon Web Services (AWS), Telstra, Transmax
Location	Ipswich, Queensland, Australia
Type of ownership (e.g. NRA involvement)	☒ Public ☐ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): late 2019 Planned duration: ☒ 0 – 2 years ☐ 2 – 5 years ☐ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☐ Traffic efficiency ☐ Customer Service ☐ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☐ Highway Chauffeur ☐ Automated Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: • Emergency braking warning (V2V) • In-vehicle speed warning (V2I) • Turning warning for bicycle riders and pedestrians (V2I) • Road works warning (V2I) • Back-of-queue warning (V2I) • Red light warning (V2I)

	• Stopped or slow vehicle warning (V2V) • Hazard warning (V2I)
Size (e.g. Km, Km²)	200 km²
Business model	
Environment	☐ Closed ☒ Open area ☐ Other, please specify:
R&D/Industry projects that were conducted at this test site/bed	

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☐ Inter-Urban ☐ Other, please specify:
Connectivity employed	☒ ITS G5 ☒ 3G ☒ 4G ☐ LTE-V2X ☐ Other, please specify:
Infrastructure support	Digital infrastructure: ☐ Cameras ☐ HD maps ☐ Other, please specify: Physical infrastructure: ☐ Road markings ☐ Road edges delineation ☒ Other, please specify: • V-ITS-S • R-ITS-S
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	

1.37 K-City (South Korea)

K-City	
General description	
Name	K-City
Short name	K-City
Partners/Consortium	South Korea Ministry of Land, Infrastructure and Transport, Korea Automobile Testing and Research Institute, Korea Transportation Safety Authority
Location	Hwaseong
Type of ownership (e.g. NRA involvement)	☒ Public ☐ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): 2018 Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☒ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☒ Road safety ☒ Traffic efficiency ☒ Customer Service ☐ Maintenance/Construction
Use Cases tested	☐ Highway Chauffeur ☐ Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☒ Other, please specify: Connectivity
Size (e.g. Km, Km²)	320.000 m^2
Business model	Placing Korea at head of autonomous driving, particularly 5G including Samsung
Environment	☒ Closed ☐ Open area

	☐ Other, please specify:
Research/Industry projects that were conducted at this test site/bed	

Technical characteristics (please check and specify, all which applies)	
Type of environment	☒ Urban ☒ Motorway ☒ Inter-Urban ☐ Other, please specify:
Connectivity employed	☐ ITS G5 ☐ 3G ☒ 4G ☒ LTE-V2X ☒ Other, please specify: 5G
Infrastructure support	Digital infrastructure: ☒ Cameras ☐ HD maps ☒ Other, please specify: GNSS jamming Physical infrastructure: ☒ Road markings ☐ Road edges delineation ☒ Other, please specify: • Fake tunnel • Trees • Weather simulation • Parking bays • Bus lanes.
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs)**	Toll booths, railway crossings, (fake) roadworks, parking, bus lanes, bike lanes http://www.businesskorea.co.kr/ news/articleView.html?idxno=27605

4 Initial assessment and pre-selection

The final step in work package two involved performing a first assessment and pre-selection of the test sites/beds in the catalogue, to evaluate their feasibility for further investigation in the next steps of the project. The aim was to reduce the 39 test sites/test beds from the wide-ranging data collection (which includes the two confidential test sites not present in this deliverable) to the most promising for further consideration towards the analysis in WP3.

This was achieved through a qualitative assessment performed by the consortium team and took into account several relevant criteria. Based on previous consultations with the PEB members as well as with the Project Officers, several criteria were considered crucial, meaning that they were considered reason for disqualification / not selecting a test site/bed for the next steps of the project. The following criteria were considered:

1. **Purpose of test site/test bed**: This criterion takes into account the use cases that can be tested at the test site/bed. Based on previous consultations with the PEB and the POs, four use cases were identified as priorities. These are:
    - Highway Chauffeur
    - Automated Shuttle Bus
    - Freight Vehicles Platooning
    - Driverless Maintenance and road works vehicles

Therefore, any test sites/beds that do not focus on any of these use cases (or equivalents) should not be considered further.

2. **Location.** This criterion takes into account the geographical location of the test site/bed. Based on the PEB priorities, test sites/beds located outside Europe should not be considered further.
3. **Availability of data.** This criterion takes into consideration the willingness of the site owners/managers/operators to cooperate with the STAPLE project, as in WP3 further analysis and investigation into the selected test sites will need strong feedback and cooperation. Therefore, any sites where no feedback was received in the first data collection procedure (i.e. completion of the Description form for the Catalogue) should not be considered for further investigation.
4. **Longevity.** This criterion takes note of the operation times of the test site/bed. Therefore, sites/beds with an operation time higher than 5 years will be prioritised. The sites/beds that have closed or will close before the STAPLE project end (2021) should not be considered further.
5. **Confidentiality level.** This criterion looks at the confidentiality level of the information provided thus far by the site owners/managers/operators. As the project will need strong cooperation and openness from the selected sites for WP3, sites/beds that have provided confidential information should not be considered further.

The full list of 39 test sites and test beds were assessed against the five criteria described above. The results yielded a list of 14 sites in Europe that can be seen in Table 1 (in no particular order).

Table 1 List of pre-selected connected and automated test sites

No	Test site/bed	Country
1.	Alp.Lab	Austria
2.	Test region DigiTrans	Austria

3.	Testbed Lower Saxony	Germany
4.	A2-M2 Connected Corridor	UK
5.	Testbed Midlands Future Mobility	UK
6.	Testbed Colas IPV	UK
7.	Horiba-MIRA	UK
8.	AURORA	Finland
9.	BOREALIS	Norway
10.	AstaZero	Sweden
11.	ZalaZONE	Hungary
12.	TRANSPOLIS	France
13.	Catalonia Living Lab	Spain
14.	IDIADA Proving Ground	Spain

5 Conclusions and next steps

This deliverable presents the results of work package two, where a wide range of connected and automated driving test sites and test beds were identified and documented. Furthermore, a detailed data collection yielded a catalogue of over 35 test sites and test beds across Europe and beyond that can be used as a point of reference going forward. The processes used to arrive at a shortlist of test sites/beds to be taken for further consideration in the next steps of the project are also presented.

The next steps include:

- Stakeholder Workshop at the CEDR WG Automation event in Tallinn, Estonia. A workshop on the 6th of March with the project officers, members of the PEB and other experts will be organised to discuss the final list of test sites that will be taken into WP3 for further investigations, as well as to identify and discuss the key performance areas for NRAs' core business.
- Stakeholder Workshop at FIRM19 in Brussels, Belgium. A subsequent workshop will be organised as a side event to the FIRM19 conference organised by FEHRL in Brussels on 27th of April, where additional insights and information will be collected from European and international stakeholders.
- Undertake a detailed investigation into a selected number of test sites including visiting a selection of sites. Following the final selection of sites (at the 1st Workshop), 2-3 visits to European test sites will be organised in conjunction with the PEB members to collect more information. Data collection in the form of online surveys, telephone interviews as well as face to face discussions (during the visits) will be conducted towards investigating the impact of test sites' activities on core NRAs' business.

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6 Annex 1: Full list of identified connected and automated driving test sites (non-exhaustive)

The full list of identified connected and automated driving test sites across Europe and beyond (Non-exhaustive). The list starts with the sites/beds located in the PEB member countries, sites/beds located in other countries (outside PEB) in Europe and sites/beds located outside Europe.

Table 2 List of identified connected and automated driving test sites (non-exhaustive)

No.	Test site/bed	Country
1.	Digital Test Bed A9	Germany
2.	Test Autonomous Driving Baden-Württemberg (TAF BW)	Germany
3.	Aldenhoven Testing Center	Germany
4.	Dusseldorf Test Track	Germany
5.	Austrian Light Vehicle Proving Region for Automated Driving (Alp.Lab)	Austria
6.	DigiTrans Test Region for automated driving with focus on freight mobility and logistics aspects (DigiTrans)	Austria
7.	A2M2 Connected Corridor	UK
8.	Smart Mobility Living Lab	UK
9.	UK Autodrive	UK
10.	UK CITE	UK
11.	Midlands Future Mobility	UK
12.	Millbrook Culham Test and Evaluation Environment (MCTEE)	UK
13.	Horiba MIRA TIC-IT	UK
14.	Project CAV Forth	UK
15.	Project Appollo	UK
16.	Testbed ServCity	UK
17.	Connected Vehicle data Exchange (ConVEX)	UK
18.	Smart City Mobility Centre	UK
19.	Colas Impact Protection Vehicle (Colas IPV)	UK
20.	Tech Valleys	UK

21.	Brainport Pilot site	The Netherlands
22.	AstaZero	Sweden
23.	Test site Stockholm (TSS)	Sweden
24.	Test site Sweden-West (TSS-W)	Sweden
25.	Modern Mobility in Barkabystaden (MMiB)	Sweden
26.	Artic Intelligent transport test ecosystem (AURORA)	Finland
27.	Millbrook Test World	Finland, UK
28.	Test ecosystems for cross-border testing with Finland (BOREALIS)	Norway
29.	Autonomous snow ploughs at airports (Yeti Project)	Norway
30.	Jaguar Land Rover Ireland CAV (JLR)	Ireland
31.	AV Living Lab (AVLL)	Slovenia
32.	ZalaZONE Automotive Proving Ground (ZalaZONE)	Hungary
33.	Testbed Trikala (Project CityMobil2)	Greece
34.	TRANSPOLIS	France
35.	Test track Nantes IFSTTAR	France
36.	CAR2ROAD Platform	France
37.	SATORY – NEXTER Systems	France
38.	CERAM UTAC Platform	France
39.	Living Lab Nouvelle Aquitaine (LUNA)	France
40.	IDIADA Proving Ground	Spain
41.	Catalonia Living Lab	Spain
42.	Sistemas Cooperativos Galicia for Cooperative and Autonomous Driving (SISCOGA4CAD)	Spain
43.	PL-AV-ROAD	Poland
44.	Australian Integrated multi-modal ecosystems (AIMES)	Australia
45.	Smart Innovation Centre	Australia
46.	Flinders Express (FLEX-Bus)	Australia
47.	You Yangs test track	Australia

48.	QUT Lab CARRS-Q	Australia
49.	Australia Automotive Research Centre (AARC)	Australia
50.	Ipscwich Connected Vehicle Pilot (ICVP)	Australia
51.	Intelligent Vehicle Proving Centre (iVPC Changshu)	China
52.	Wrinatec	China
53.	I-Vista ChongQing Liangjiang (I-Vista)	China
54.	CATARC Tianjin	China
55.	K-City	South Korea
56.	Texas A&M University System (TAMUS)	US
57.	University of Michigan's Mcity	US
58.	Transportation Research Center (TRC)	US
59.	Virginia Automated Corridor and the Virginia Connected Corridor (VAC and VCC)	US
60.	Virginia Smart Roads	US
61.	Proving Ground Pilot Site at City of Pittsburgh and the Thomas D. Larson Pennsylvania Transportation Institute	US
62.	Texas AV Proving Ground Partnership – incl. the A&M System's RELLIS Campus	US
63.	U.S. Army Aberdeen Test Center	US
64.	American Center for Mobility (ACM) at Willow Run	US
65.	Contra Costa Transportation Authority (CCTA) & GoMentum Station	US
66.	Proving Ground Pilot Site at San Diego Association of Governments (SANDAG)	US
67.	Proving Ground Pilot Site at Iowa City Area Development Group	US
68.	Proving Ground Pilot Site at University of Wisconsin-Madison	US
69.	Central Florida Automated Vehicle Partners – incl. the SunTrax test	US
70.	Proving Ground Pilot Site at Notrh Carolina Turnpike Authority	US
71.	Proving Ground Pilot Site at Ford – Argo Washington DC	US

7 Annex 2 Description form template

SiTe Automation Practical Learning (STAPLE) TEST BED/ TEST SITE DESCRIPTION FORM	
General description	
Name	
Short name	
Partners/Consortium	
Location	
Type of ownership (e.g. NRA involvement)	☐ Public ☐ Private ☐ PPT – joint ☐ Other, please specify:
Lifespan (past and future planned activities)	Start of operation (year): _ Planned duration: ☐ 0 – 2 years ☐ 2 – 5 years ☐ > 5 years ☐ Undefined ☐ Other, please specify:
Business areas	☐ Road safety ☐ Traffic efficiency ☐ Customer Service ☐ Maintenance/Construction ☐ Other, please specify:
Use Cases tested	☐ Highway Chauffeur ☐ Automated Shuttle bus ☐ Freight Vehicles platooning ☐ Driverless maintenance and road works vehicles ☐ Other, please specify:
Size (e.g. Km, Km^2)	
Business model	
Environment	☐ Closed

	☐ Open area ☐ Other, please specify:
R&D/Industry projects that are/were conducted at this test site/bed	

Technical characteristics (please check and specify, all which applies)	
Type of environment	☐ Urban ☐ Motorway ☐ Inter-Urban ☐ Other, please specify:
Connectivity employed	☐ ITS G5 ☐ 3G ☐ 4G ☐ LTE-V2X ☐ Other, please specify:
Infrastructure support	Digital infrastructure: ☐ Cameras ☐ HD maps ☐ Other, please specify: Physical infrastructure: ☐ Road markings ☐ Road edges delineation ☐ Other, please specify:
Other specific characteristics **(e.g. traffic elements – intersections, tunnels, toll area, etc; speed limits; RSUs**	