
HILL DESCENT MONITORING SCHEMES



SCHEMES USING THE TELEMATICS
MONITORING APPLICATION (TMA)

MARCH 2020

HILL DESCENT MONITORING SCHEMES

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1.0	November 2018	First version
2.0	December 2019	Updated as HDM schemes associated with the Telematics Monitoring Application (TMA). The common elements and processes of HDM schemes are described in the body of the document, and each scheme is described in appendices that are specific to each Authority.
2.1	March 2020	Replaced the term 'telematics in-vehicle unit' with 'telematics device'. To Appendix B, added a new 'Hill Descent Monitoring – Bedforddale Hill Scheme'.

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- Provides a national platform for the use of telematics and related intelligent technologies
- Supports different applications across regulatory, contractual and commercial needs
- Supports different levels of assurance
- Is outcome-focussed and encourages innovation.

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1 INTRODUCTION

1.1 PURPOSE

This document describes Hill Descent Monitoring (HDM) schemes associated with the Telematics Monitoring Application (TMA). An HDM scheme is administered by an appropriate road authority or regulator ('Authority').

1.2 SCOPE

This document describes HDM schemes and how they will be used with the TMA application

The following information is included:

- parameters of HDM schemes;
- key processes of HDM schemes;
- roles and responsibilities of HDM scheme participants; and
- scheme descriptions in appendices, organised by Authority.

1.3 BACKGROUND

Hill Descent Monitoring schemes provide Authorities with a way to manage sections of road with hazardous grades and road alignments. Using HDM schemes, Authorities can use type-approved telematics devices to provide data on vehicle compliance with restrictions placed on access to specific hills.

An HDM scheme is a specific use of the TMA application linked to delivering a policy objective. To participate in an HDM scheme, an Operator (e.g. a transport operator) must conform with the requirements specified within a permit or Notice. Enrolment in the TMA application, which is administered by TCA as part of the National Telematics Framework (NTF), is one of these requirements.

Data is collected from vehicles fitted with TCA type-approved telematics devices. Application Service Providers (ASPs) provide data to TCA. TCA analyses the data and makes reports available to the Authority via the Telematics Analytics Platform (TAP).

If required by an HDM scheme, in addition to indicating speed on a nominated route, reports can indicate:

- whether a driver has stopped for at least 30 seconds before the descent (for example, in order to perform required safety checks); and/or
- on-board mass and vehicle configuration.

The TMA application is offered at Level 2 Assurance (see Appendix A for a definition of Level 2 Assurance).

The use of the TMA application for an HDM scheme:

- provides identifiable vehicle data of enrolled vehicles on the nominated route; and
- allows an ASP, certified to provide TMA services, to offer any scheme associated with the TMA application.

Note: The TMA application can be used for a variety of purposes. In this document, TMA is described in the context of the scheme.

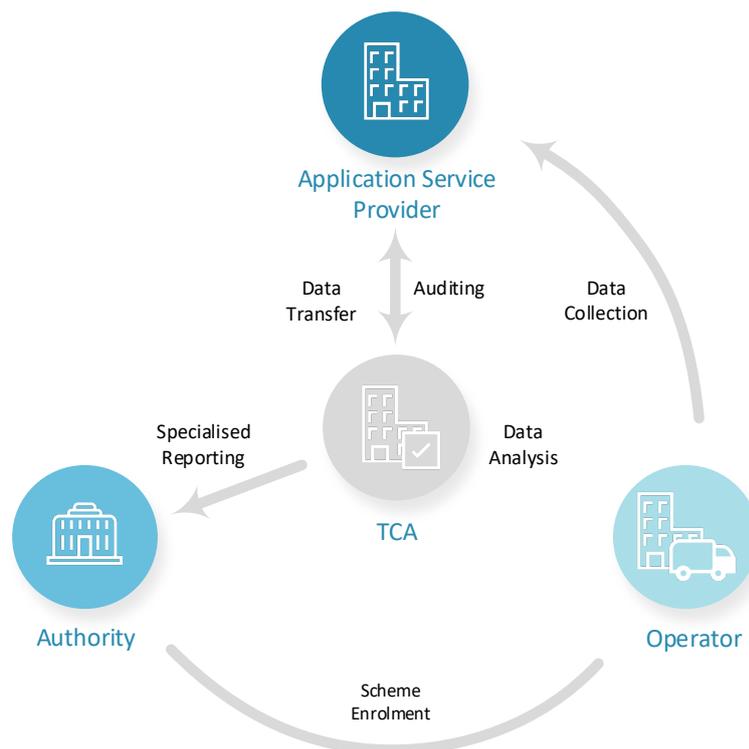
2 HILL DESCENT MONITORING SCHEMES

2.1 PARTICIPANTS

Figure 1 outlines the key interactions between participants for the use of the TMA application for an HDM scheme:

- The Authority, as the producer of the scheme, will access network reports from TCA, generated using telematics data collected through the TMA application;
- Operators are vehicle operators that agree to enrol vehicles in the scheme, and consent to their data collected through the TMA application to be used for the intended purpose;
- ASPs, certified by TCA, offer telematics services (hardware, software and associated processes) to enable enrolment of eligible vehicles in one or more applications available within the NTF, collection of data from installed telematics devices, and reporting of data to TCA; and
- TCA administers the TMA application and its schemes within the NTF, ensuring that data security and privacy concerns are managed. TCA receives vehicle enrolment details from Operators via ASPs, and makes ASP–Transport Operator Agreements available to participants. TCA also receives telematics data from ASPs, performs data analysis, and makes standard and specialised reports available to the Authority via TAP as agreed between the Authority and TCA.

Figure 1: Scheme Participants and Key Interactions



Note: Interactions between scheme participants are consistent with interactions between TMA application participants, and are not specific to the scheme.

2.2 COMMON SCHEME FEATURES

This section describes the common features of an HDM scheme. It includes optional features of the TMA application that may be utilised by an HDM scheme. For information on features that are specific to an HDM scheme, refer to scheme descriptions in the appendices of this document.

a. ASP Certification

TCA will certify ASPs to provide services for the TMA application.

b. Enrolment

ASPs will enrol vehicles in TMA at the request of the Operator.

The ASP will manage key steps of enrolment including approval, and as necessary, cancellation and replacement. There will be no interim enrolment.

Figure 2 shows the pre-enrolment steps for an HDM scheme.

Figure 3 shows the reporting processes for an HDM scheme

Figure 4 shows the enrolment cancellation and reporting processes for an HDM scheme.

c. Devices and Data Collection

The telematics device used in the TMA application is a TCA type-approved telematics device.

The telematics device will collect position data at 30-second intervals.

The following apply **only** if required by a scheme:

- If vehicle configuration and mass data is required, the data will be collected from vehicles with type-approved Category B or C OBM systems installed. The OBM system shall collect the data at 5-minute intervals.
- If self-declared data is required, self-declared data is manually collected via a user interface.

Note: Refer to the scheme descriptions in the appendices of this document to determine whether the scheme requires these optional features.

d. Data Reporting

The ASP shall transfer data records collected through TMA to TCA no less frequently than each calendar month, and as described in *Telematics Business-to-Business Data Exchange Functional and Technical Specification*.

e. Data Analysis and Reports

TCA will make data analysis and reporting for the scheme available to the Authority through TAP.

Through TAP, the Authority will have access to:

- interactive maps, specific to the hill(s) being monitored, which represent data collected as part of the scheme; and
- specific reports required for scheme management (refer to the scheme description for examples).

Note: The type, number and frequency of specific reports will be subject to agreed terms reached between TCA and the Authority.

The use of TMA for this scheme is intended to provide a basic representation of individual and identifiable vehicle movements for comparison against the approved road network.

The Authority will manually review the operation of vehicles (through TAP) against the approved road network. TCA does not offer automated exception reporting to assess whether a vehicle has not met access conditions granted by the Authority.

A Scheme Enrolment Report will be made available to the Authority on a monthly basis via TAP. This report may include the following standard measures and dimensions as shown in Table 1.

Table 1: Scheme Enrolment Report

Report Content	Examples
Aggregated measures	<ul style="list-style-type: none"> • Count of all vehicles enrolled in the scheme • Count of vehicles enrolled in the scheme that TCA received data from • Vehicles participating in the scheme that TCA did not receive data from for at least 30 consecutive days <p><i>Note: Reporting of this measure will include vehicle identities. An enrolled vehicle will only be included in this measure if, without a satisfactory explanation, it has not provided data for at least 30 consecutive days.</i></p> <ul style="list-style-type: none"> • Count of Operators with vehicles enrolled in the scheme • Count of ASPs reporting data for vehicles enrolled in the scheme
Dimensions	<ul style="list-style-type: none"> • Operator • ASP
Typical reporting and analysis	<ul style="list-style-type: none"> • Month-on-month trend analysis of data related to scheme participation • Count of the total number of traversals monitored by day of week (over defined time periods), in each direction, by vehicle category

2.3 KEY SCHEME PROCESSES

Figure 2 outlines the key actions taken by each participant during the pre-enrolment stage of the operation of an HDM scheme.

Note: This process assumes that TCA has already certified the ASP to provide TMA services.

Figure 2: Pre-Enrolment Process

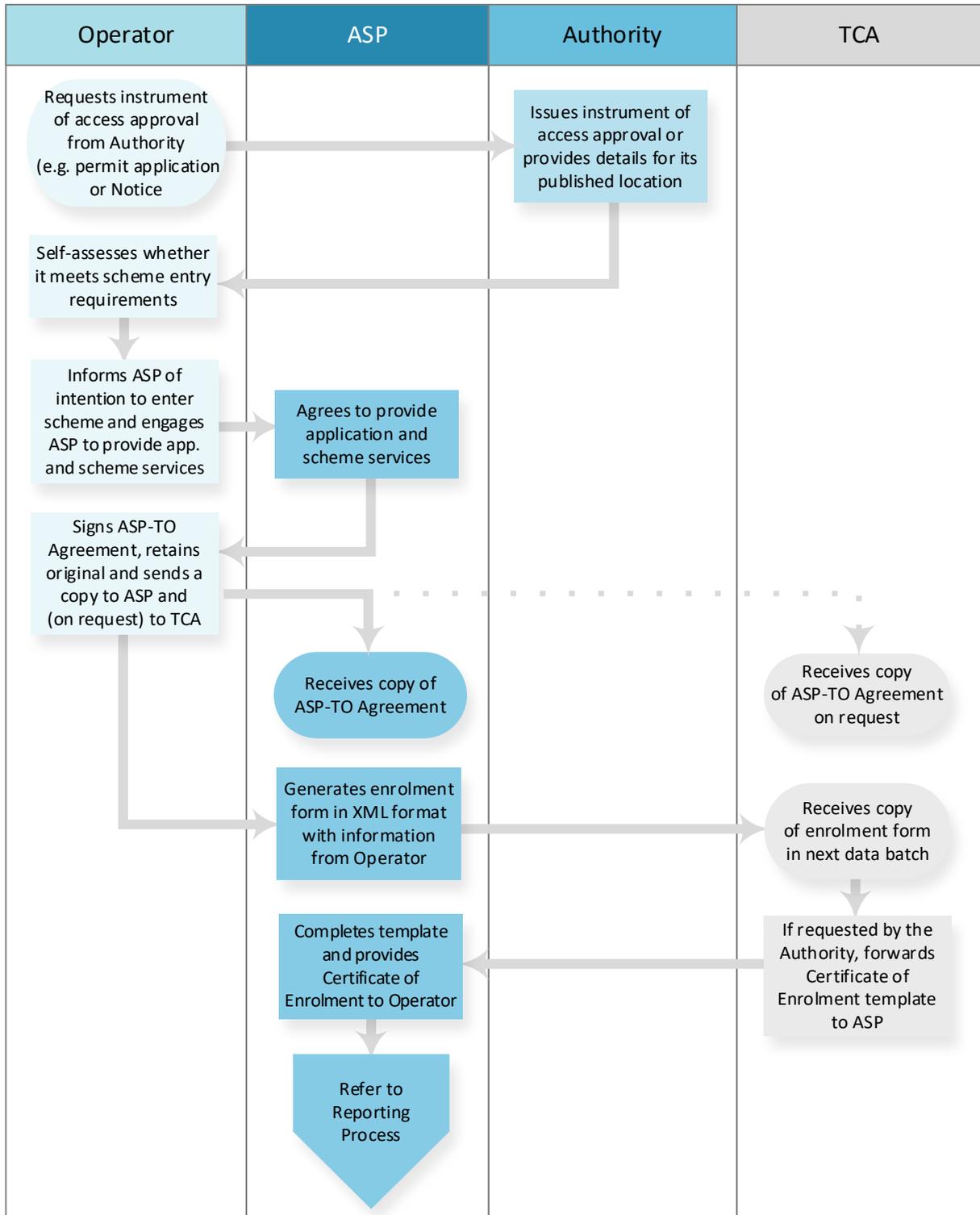
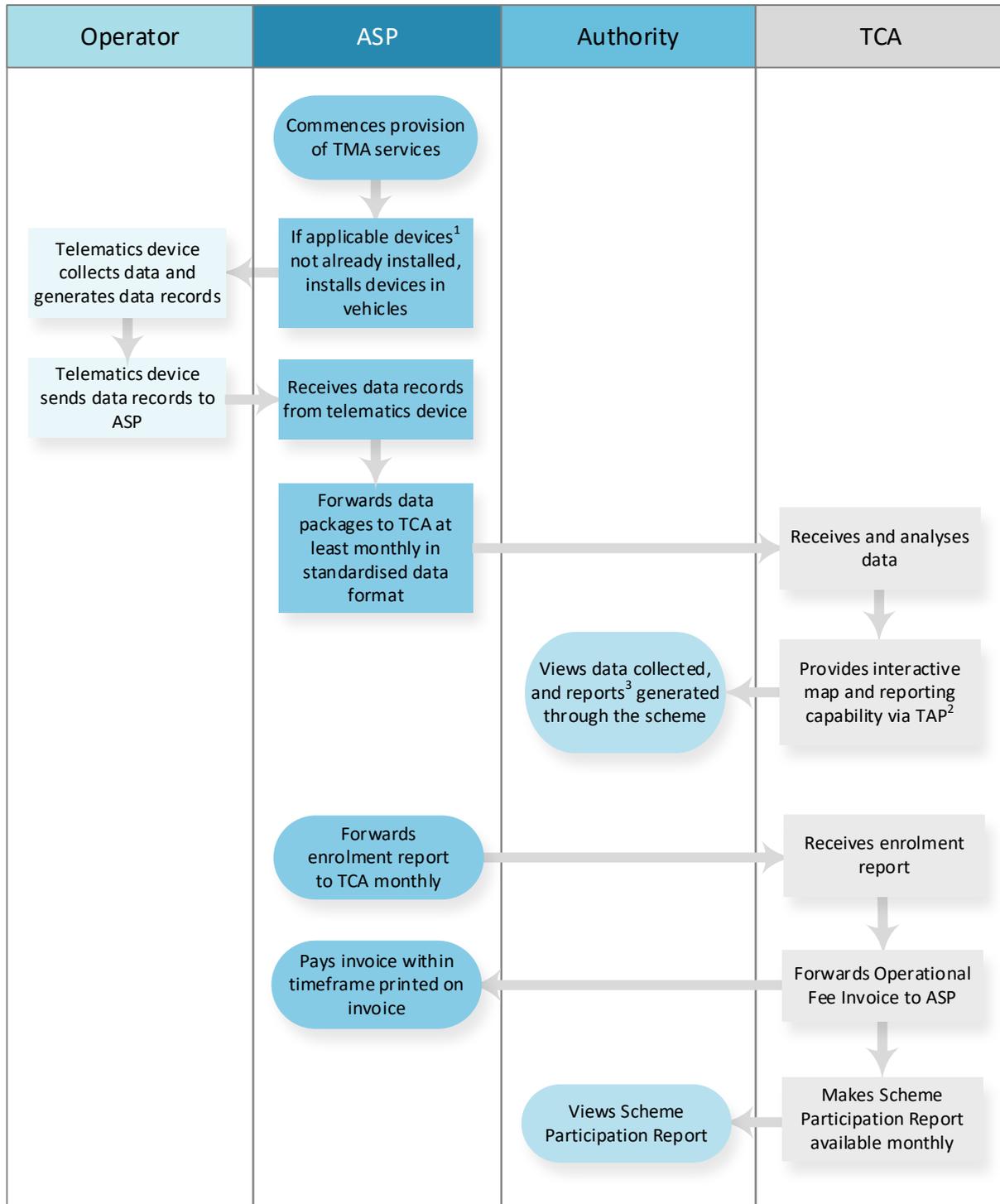


Figure 3 outlines the key actions related to data collection, record generation and reporting.

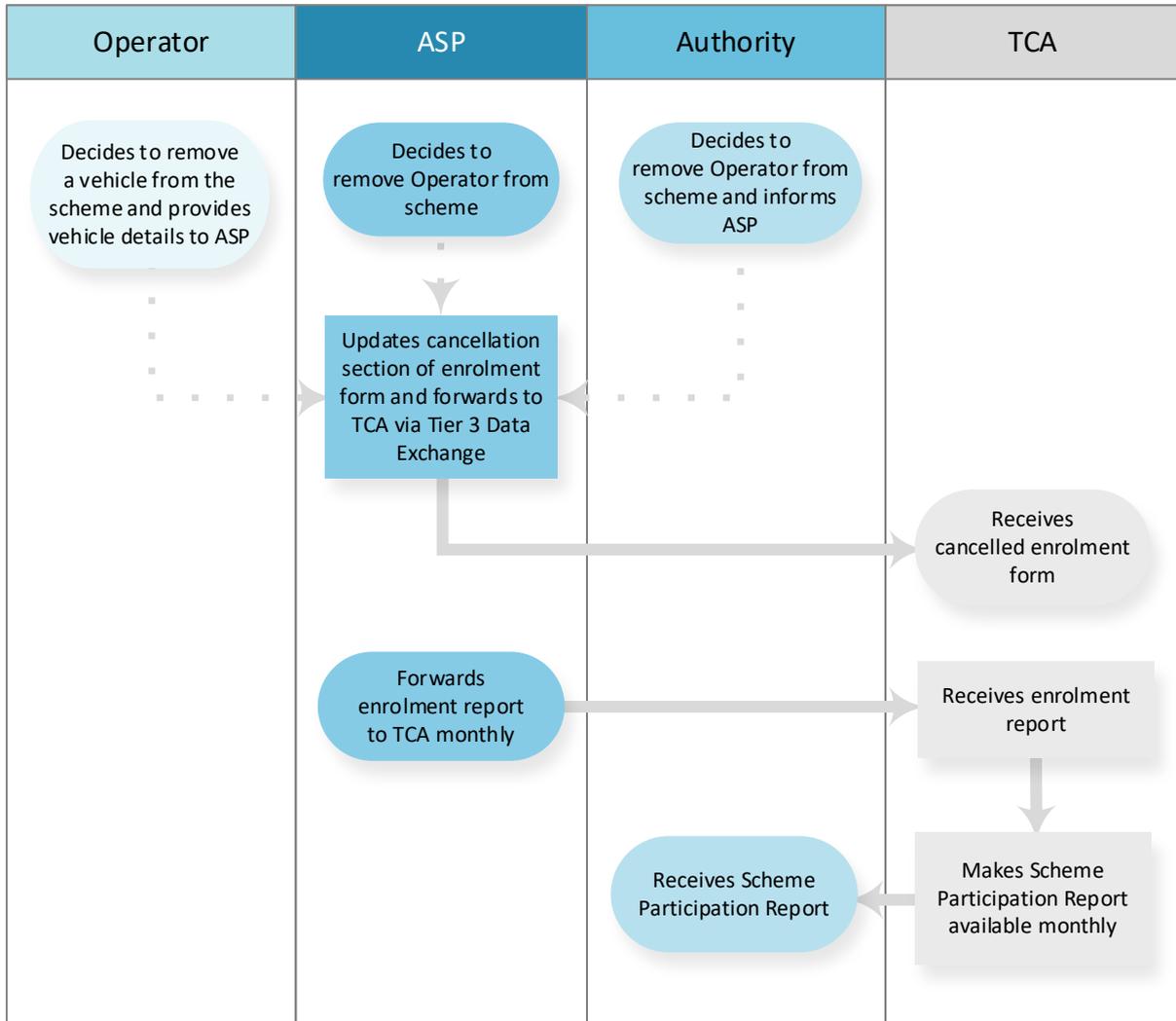
Figure 3: Reporting Processes



1. Applicable devices include a type-approved telematics device, and:
 - If mass and vehicle configuration will be collected, a type-approved OBM system at Category B or C; and/or
 - If comments are self-declared, a user interface connected to the type-approved telematics device.
2. Data will be updated at least monthly.
3. The Authority will nominate the locations that will be subject to location-based reports (subject to agreed terms).

Cancellation of enrolment may be initiated by the Operator, the Authority or the ASP.
 Figure 4 outlines the key actions to discontinue enrolment of a vehicle in the scheme.

Figure 4: Enrolment Cancellation and Reporting Processes



2.4 ROLES AND RESPONSIBILITIES

In delivering the objectives of an HDM scheme, **TCA** will:

- provide a document (this document) describing the use of the scheme as part of the TMA application;
- produce or maintain collateral, as necessary, to support the scheme. Examples include the provision of current versions of:
 - *Telematics Monitoring Application Functional and Technical Specification;*
 - *Telematics Business-to-Business Data Transfer Functional and Technical Specification;*
 - *Telematics Device Functional and Technical Specification;*
 - (as required by a scheme) *On-Board Mass System Functional and Technical Specification;*
 - (as required by a scheme) *Interconnectivity of Telematics Device with Other Systems Functional and Technical Specification.*
- support the reporting of data records via Tier 3 Data Exchange using a RESTful API, with these records formatted using JSON;
- support the reporting of enrolment forms and enrolment reports using a RESTful API, with these documents formatted using XML;
- inform ASPs of the scheme details and entry conditions;
- produce an ASP–Transport Operator Agreement for use with the scheme and make it available from the TCA website;
- ensure that TAP is set up to enable the Authority to obtain reports generated by the scheme, and any malfunctions associated with vehicles enrolled in the scheme;
- maintain the cloud environment and databases, etc. for receipt of data records from the TMA application;
- produce and execute an ASP–TCA Certification Agreement, which formalises the relationship between TCA and the ASP with regard to ASP certification, or update the current Agreement;
- assess and certify whether an ASP meets requirements to provide TMA services;
- type-approve applicable devices used in the scheme;
- ensure the intellectual property rights of ASPs are protected when assessing whether an ASP can meet operational requirements of the scheme;
- if required by the Authority, provide certified ASPs with the Certificate of Enrolment template;
- forward Operational Fee Invoices to ASPs upon receipt of enrolment reports;
- provide the Authority with reports outlined in 2.2e via TAP; and
- ensure the confidentiality of ASP data is maintained.

The Authority will:

- develop necessary business cases and policy documentation required by the Authority for the scheme;
 - undertake program coordination activities related to the scheme with TCA;
 - monitor whether device malfunctions have been resolved within agreed timeframes; and
- Note: TCA will notify the ASP when data has not been received for one month, followed by the Authority if unresolved.*
- access reports outlined in 2.2e via TAP, and review data trends and numbers of enrolled vehicles.

ASPs will:

- interact with TCA to establish the delivery mechanism for provision of data packages to TCA (noting that a data package includes data records, enrolment forms and enrolment reports);
- receive notification from Operators regarding the enrolment status of vehicles in the scheme, and forward this information to TCA using an agreed mechanism on a monthly basis;
- provide the ASP–Transport Operator Agreement to an Operator once an agreement to provide services for the scheme has been made;
- be responsible for the installation, operation and maintenance of telematics devices and the reporting of data received from those devices;
- if required by the Authority, provide Certificates of Enrolment to enrolled Operators, using the template received from TCA, and coordinate their removal from vehicles no longer enrolled in the scheme;
- pay Operational Fee Invoices received from TCA, generated upon receipt of enrolment reports, within the timeframe shown on the invoice;
- in the event of a device malfunction: liaise with the Operator and/or device supplier to resolve the issue; report the malfunction (unidentifiable) to TCA within the required time period; and notify TCA when the malfunction has been resolved;
- provide back office capability to process collected data records as required by the scheme; and
- deliver data records to TCA, using agreed data delivery mechanism, required data formats and meeting data reporting requirements.

Operators will:

- access scheme rules and entry conditions on the Authority website (or other website as applicable, such as the National Heavy Vehicle Regulator) and determine whether they meet those conditions;
- apply for the permit or Notice and ensure compliance with the permit or Notice requirements for the scheme;
- upon self-assessment that scheme entry conditions are met, notify the ASP of its intention to enrol in the scheme;
- agree to share data collected by its ASP with TCA for the scheme using a signed ASP–Transport Operator Agreement;
- follow rules for enrolment in the scheme;
- store original signed ASP–Transport Operator Agreement and forward copies to the ASP and TCA (on request);
- install telematics devices (including any connected devices, as required by a scheme) and engage an ASP to provide services for the scheme; and
- notify the ASP of the date that a vehicle or the Operator will no longer participate in the scheme.

A ACRONYMS AND DEFINITIONS

ACRONYMS

Acronym	Definition
ASP	Application Service Provider
FTPS	File Transfer Protocol Secure
MRWA	Main Roads Western Australia
NTF	National Telematics Framework
TAP	Telematics Analytics Platform
TO	Transport Operator

DEFINITIONS

Term	Definition
application	A capability of the NTF that provides business value to stakeholders, delivered as an assembly of policy, business components and technical components, within in the context of an identified level of assurance.
Application Service Provider (ASP)	A service provider that has been certified by TCA as meeting the requirements of one of more telematics applications.
ASP–TCA Certification Agreement	The written agreement made between TCA and an ASP that recognises the fact that the ASP, having satisfied TCA's requirements for appointment as an ASP, is appointed in that capacity, and sets out the legal obligations of each party with respect to the ongoing role of the ASP.
ASP–Transport Operator Agreement	A written agreement between an ASP, an Operator and TCA which sets out the terms on which the ASP will provide application services to the Operator.
Authority	An entity, associated with a jurisdiction, responsible for the administration of one or more NTF applications. An Authority may appoint an administrator to perform its functions. <i>See also jurisdiction.</i>
connected device	Any device or technology connected to a telematics device.
data record	A discrete and defined set of data elements generated by a device.
data package	A package of information sent via Tier 3 Data Exchange for a data collection period
enrolment	Both the process and outcome by which an Operator enters an Authority's scheme. Each vehicle must be enrolled for each scheme it participates in. Enrolment also confirms the application and conditions (if applicable) that the vehicle is monitored under.
enrolment form	An electronic document that formally and simultaneously records the enrolment of a vehicle within a scheme, and within the application required by that scheme.
enrolment report	A summary of enrolments relevant to a given Authority for a specified reporting period, including any aggregated data required by specific applications.
jurisdiction	A geographical area containing a road network (i.e. typically an Australian state or territory).
level of assurance	An assurance level that supports telematics applications, structured around the intended use of a telematics application, risks being managed, and the needs and expectations of consumers and other stakeholders.
Level 2 Assurance	Independent assessment of specific elements of a telematics application. Telematics data is combined with other data sources.

Term	Definition
OBM system category	<p>A category of OBM system that is defined as follows:</p> <ul style="list-style-type: none"> • Category A – OBM systems in this category electronically display collected data to drivers and/or loaders. • Category B – OBM systems in this category also collect data and transfer the collected data to a telematics device using a mechanism agreed and implemented by the manufacturer of the telematics device and the OBM system. • Category C – OBM systems in this category collect data and transfer data records in a standardised way to an telematics device (in accordance with <i>Interconnectivity of Telematics Device with Other Systems Functional and Technical Specification</i>).
Operator	An entity that operates one or more vehicles eligible to enter a scheme.
scheme	The generic term for a specific use of an application linked to delivering a policy objective.
self-declaration	The self-declaration of data by an Operator and/or its nominated representative to the ASP.
telematics device	The primary telematics unit which monitors vehicle parameters.
Tier 1 Data Exchange	A web services solution where structured information is exchanged that complies with requirements such as authentication, security, privacy and certainty of delivery. It includes exchanges of information related to a vehicle's enrolment in telematics applications, conditions and adherence to those conditions.
Tier 2 Data Exchange	The human-initiated (rather than automated) exchange of business-related information and advice. Typical exchanges via this tier include reporting of issues and resolutions, correspondence regarding certification and re-certification, advice regarding information and communications technology (ICT), data assurance and other reporting.
Tier 3 Data Exchange	The packaging and delivery of data packages, comprising data records and enrolment-related artefacts. Data packages have several uses which include data analysis by the recipient, data assurance, and for research purposes.
vehicle configuration	A technical representation of the on-road footprint of the vehicle (that is, the number and configuration of trailers and axle groups), and is determined using data from the OBM system and data supplied by the ASP. It is typically captured with axle group pattern notation, for example '2-44/S444' for the vehicle category of Semi Trailer 6 Axle.

B HDM SCHEMES FOR MAIN ROADS WESTERN AUSTRALIA

B.1 HILL DESCENT MONITORING – ROELANDS HILL SCHEME

Purpose

The Hill Descent Monitoring – Roelands Hill Scheme is a scheme administered by Main Roads Western Australia (MRWA) to monitor:

- the estimated speed of Category 7 (A) AB Triples operating under permit on part of the MRWA road network, namely Roelands Hill (noting the permit to operate will be related to this section of road only, and any other permits that vehicles operate under are considered separately);
- whether enrolled vehicles stop for a sufficient period prior to descending Roelands Hill; and
- whether enrolled vehicles exceed the 40 km/h speed limit when descending Roelands Hill.

The scheme will initially be used as part of a hill descent monitoring trial undertaken by MRWA, involving vehicles travelling on the Coalfields Highway on Roelands Hill. The trial period is scheduled to run up for to 12 months.

Background

The Coalfields Highway is a major route that travels from Collie to Roelands (near Bunbury, south of Perth).

The trial, to be undertaken by MRWA over a 12-month period, will include the monitoring of Category 7 (A) AB Triples with tri-axle group trailers travelling on the Coalfields Highway and descending the 2.2 km length of Roelands Hill under a permit arrangement, where a 40 km/h speed limit applies.

Vehicles are required to stop prior to descending Roelands Hill, to enable checking of loads, brakes and the selection of low gear.

To participate in the scheme, Operators must conform with the requirements specified within the permit described on the MRWA website.

Scheme Features

The following features are specific to the scheme:

a. Devices and Data Collection

The device used in the TMA application is a TCA type-approved telematics device.

The telematics device will collect position data at 30-second intervals.

The collection of mass or self-declared data is not required.

b. Data Analysis and Reports

Through TAP, MRWA will have access to specific reports required for scheme management – for example,

- Estimated vehicle speed between two points every 30 seconds along Roelands Hill
- Average vehicle speed along the length of Roelands Hill
- Period of time that each vehicle is stopped just prior to travelling down Roelands Hill
- Speed reports for enrolled vehicles that exceed 40 km/h down Roelands Hill.

Other aspects of this scheme operate in accordance with generic HDM processes, such as ASP Certification, Enrolment, Data Reporting, and Data Analysis and Reports. For more information, see 2.2.

Data Element Reference Values

Refer to the following when entering scheme name or Authority code values to an enrolment report or enrolment form:

Table B.1: HDM – Roelands Hill Scheme Name and Authority Code

Scheme Name (full)	Abbreviated Scheme Name (for enrolment report and form)	Authority Code
Hill Descent Monitoring – Roelands Hill	HDMROE	WA

B.2 HILL DESCENT MONITORING – LESMURDIE HILL SCHEME

Purpose

The Hill Descent Monitoring – Lesmurdie Hill Scheme is a scheme administered by Main Roads Western Australia (MRWA) to monitor:

- the estimated speed of vehicles on the National PBS Level 2B Scheme operating under permit on part of the MRWA road network, namely Lesmurdie Hill (noting the permit to operate will be related to this section of road only, and any other permits that vehicles operate under are considered separately);
- whether enrolled vehicles stop for a sufficient period prior to descending Lesmurdie Hill; and
- whether enrolled vehicles exceed the 40 km/h speed limit when descending Lesmurdie Hill.

The scheme will initially be used as part of the same hill descent monitoring trial undertaken by MRWA as similarly described for the Roelands Hill Scheme. The trial period is scheduled to run up for to 12 months.

Background

Welshpool Road East is a major route that travels from Carmel to the Roe Highway (south of Perth).

As described similarly for the Roelands Hill Scheme, the trial, to be undertaken by MRWA over a 12-month period, will include the monitoring of vehicles on the National PBS Level 2B Scheme (up to 30.0m long) travelling on Welshpool Road East and descending the 4 km length of Lesmurdie Hill under a permit arrangement, where a 40 km/h speed limit applies.

Vehicles are required to stop prior to descending Lesmurdie Hill, to enable checking of loads, brakes and the selection of low gear.

To participate in the scheme, Operators must conform with the requirements specified within the permit described on the MRWA website.

Scheme Features

The following features are specific to the scheme:

a. Devices and Data Collection

The device used in the TMA application is a TCA type-approved telematics device.

The telematics device will collect position data at 30-second intervals.

The collection of mass or self-declared data is not required.

b. Data Analysis and Reports

Through TAP, MRWA will have access to specific reports required for scheme management – for example,

- Estimated vehicle speed between two points every 30 seconds along Lesmurdie Hill
- Average vehicle speed along the length of Lesmurdie Hill
- Period of time that each vehicle is stopped just prior to travelling down Lesmurdie Hill
- Speed reports for enrolled vehicles that exceed 40 km/h down Lesmurdie Hill.

Other aspects of this scheme operate in accordance with generic HDM processes, such as ASP Certification, Enrolment, Data Reporting, and Data Analysis and Reports. For more information, see 2.2.

Data Element Reference Values

Refer to the following when entering scheme name or Authority code values to an enrolment report or enrolment form:

Table B.2: HDM – Lesmurdie Hill Scheme Name and Authority Code

Scheme Name (full)	Abbreviated Scheme Name (for enrolment report and form)	Authority Code
Hill Descent Monitoring – Lesmurdie Hill	HDMLES	WA

B.3 HILL DESCENT MONITORING – BEDFORDALE HILL SCHEME

Purpose

The Hill Descent Monitoring – Bedfordale Hill Scheme is a scheme administered by Main Roads Western Australia (MRWA) to monitor:

- the estimated speed of 36.5-metre A-Double combinations (prime mover, semi-trailer towing a 5 or 6-axle dog trailer) operating under permit on part of the MRWA road network, namely Bedfordale Hill (noting the permit to operate will be related to this section of road only, and any other permits that vehicles operate under are considered separately);
- whether enrolled vehicles stop in the Bedfordale Road Train Assembly Area (RTAA) for a sufficient period prior to descending Bedfordale Hill; and.
- whether enrolled vehicles exceed the 40 km/h speed limit when descending Bedfordale Hill.

The scheme will initially be used as part of the same hill descent monitoring trial undertaken by MRWA as similarly described for the Roelands Hill Scheme. The trial period is scheduled to run up for to 12 months.

Background

The trial will provide specific access on Albany Highway, between the Bedfordale Road Train Assembly Area and Armadale Road, as well as Armadale Road from Albany Highway to Tonkin Highway as shown on the map at <https://www.mainroads.wa.gov.au/UsingRoads/HVS/Updates/Current/Pages/HVS-8---2020.aspx>.

As described similarly for the Roelands Hill Scheme, the trial, to be undertaken by MRWA over a 12-month period, will include the monitoring of 36.5-metre A-Double combinations travelling along the Albany Highway between the Bedfordale Road Train Assembly Area and immediately before Armadale Road under a permit arrangement, where a 40 km/h speed limit applies.

Vehicles are required to stop prior to descending Bedfordale Hill, to enable checking of loads, brakes and the selection of low gear.

To participate in the scheme, Operators must conform with the requirements specified within the permit described on the MRWA website.

Scheme Features

The following features are specific to the scheme:

a. Devices and Data Collection

The device used in the TMA application is a TCA type-approved telematics device.

The telematics device will collect position data at 30-second intervals.

The collection of mass or self-declared data is not required.

b. Data Analysis and Reports

Through TAP, MRWA will have access to specific reports required for scheme management – for example,

- Estimated vehicle speed between two points every 30 seconds along Bedfordale Hill
- Average vehicle speed along the length of Bedfordale Hill
- Period of time that each vehicle is stopped just prior to travelling down Bedfordale Hill
- Speed reports for enrolled vehicles that exceed 40 km/h down Bedfordale Hill.

Other aspects of this scheme operate in accordance with generic HDM processes, such as ASP Certification, Enrolment, Data Reporting, and Data Analysis and Reports. For more information, see 2.2.

Data Element Reference Values

Refer to the following when entering scheme name or Authority code values to an enrolment report or enrolment form:

Table B.2: HDM – Bedfordale Hill Scheme Name and Authority Code

Scheme Name (full)	Abbreviated Scheme Name (for enrolment report and form)	Authority Code
Hill Descent Monitoring – Bedfordale Hill	HDMBED	WA



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