

Code of practice for electronic road user charges management systems





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Record of amendment

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0.4	31 July 2014	Updated draft with agreed input from July 2014 meeting. Reflects input from public comment period.	James Burgess
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0.7	21 August 2020	Reviewed and updated by the eRUC committee.	Bryan Talbot
0.8	1 October 2021	Reviewed and updated by the eRUC committee.	Bryan Talbot

1 Introduction

This code of practice outlines the processes and requirements for operating electronic systems to collect road user charges (RUC).

1.1 Road user charges and eRUC

RUC has operated in New Zealand as a manual system since 1978. Electronic road user charges (eRUC) has operated since 2010 as an alternative collection method offering improved efficiency.

Electronic system providers (ESPs) operate eRUC under contract as agents of Waka Kotahi.

The required outcomes for any eRUC system are to:

- accurately measure and record RUC data, including distance, time and location
- display specified RUC information in each vehicle
- correctly attribute RUC data to a specific vehicle and operator
- collect appropriate revenue from the vehicle operator and payment to Waka Kotahi.

1.2 The objectives of this code of practice

This code of practice provides an authoritative single source of guidance for the performance and implementation of eRUC systems. It aims to:

- describe the roles and responsibilities of government
- minimise barriers to potential ESPs entering the market
- promote transparency
- support ESPs' compliance with relevant international standards and New Zealand legislation.

By doing this, this code of practice helps to give ESPs confidence that eRUC products meet or exceed the minimum performance requirements for accuracy and reliability;

that they have been through the required testing and auditing processes; and that they are secure and tamper-evident.

1.3 The structure of this code of practice

This code of practice has the following format:

- Part 1 sets out the process for applying for an approval from the RUC collector.
- Part 2 sets out the functional requirements and outcome-based performance requirements on which the testing process is based.
- Part 3 describes terms and conditions that may accompany the RUC collector's approval.

1.4 Legal authority

The RUC system is operated under the Road User Charges Act 2012 (the act) and the Road User Charges Regulations 2012 (the regulations). ESPs should familiarise themselves with this legislation before contacting Waka Kotahi, and seek legal advice if necessary.

Where this code of practice differs from the latest legislation, the legislation takes precedence.

1.5 Existing intellectual property

ESPs are responsible for ensuring that their methodology for their electronic system, including the electronic distance recorder, does not infringe any existing intellectual property rights. The approval process administered by Waka Kotahi does not involve the consideration of such matters and Waka Kotahi bears no responsibility for intellectual property disputes.

2 Roles and responsibilities

This section describes the roles of the various participants in an electronic RUC system.

2.1 The Ministry of Transport

The Ministry of Transport administers the RUC legislation and is responsible for:

- providing policy advice to the government on changes to RUC legislation
- advising the Minister of Transport on RUC rates and fees
- monitoring improvements in technology.

2.2 Waka Kotahi

Waka Kotahi administers the RUC system as the RUC collector as prescribed in the act and is responsible for:

- collecting RUC, including appointing agents to act on its behalf
- auditing and investigating vehicle operators in order to assess RUC compliance and, when necessary, recover outstanding RUC
- granting approvals for electronic system providers under section 43 of the act
- managing the process of testing electronic systems
- auditing ESPs to ensure compliance with service delivery agreements and this code of practice
- monitoring improvements in technology.

2.3 The New Zealand Police

The New Zealand Police enforce the RUC regime through the criminal justice system.

The police are responsible for:

- assessing each proposed model of electronic system as part of Waka Kotahi testing process, and confirming that it meets the needs of roadside enforcement of RUC
- enforcing RUC at the roadside, usually through making roadside inspections and undertaking prosecution.

2.4 Electronic system providers (ESPs)

ESPs are responsible for:

- developing or providing the electronic system
- issuing electronic RUC licences and forwarding revenue to Waka Kotahi
- ensuring that electronic RUC services are performed in accordance with the terms of their service delivery agreement with Waka Kotahi
- managing the installation, repair and exception resolution process for their electronic systems on an ongoing basis (including monitoring attempts to tamper with the electronic system)
- ensuring that vehicle operators have access to records that ESPs hold on the operator's behalf
- complying with RUC legislation
- obtaining legal advice to avoid infringing intellectual property rights
- abiding by this code of practice.

2.5 Vehicle operators

A vehicle operator is an operator of one or more vehicles subject to RUC. In the context of electronic RUC, vehicle operators are responsible for:

- engaging the services of an electronic system provider
- purchasing appropriate RUC licences
- ensuring that each vehicle is fitted with a functioning, approved distance recorder
- notifying Waka Kotahi of a change of distance recorder (although in some instances an ESP may undertake this process on their behalf)
- ensuring compliance with RUC legislation.

Part 1:

Applying for an approval

3 Electronic system provider approval process

3.1 Application requirements

All applications for approval must be made to Waka Kotahi Agency as the RUC collector. The approval is granted under section 43 of the act.

The RUC collector must be satisfied that the electronic system is fit for the purpose.

An approval may be subject to terms and conditions imposed at the discretion of the RUC collector (refer to part 3 of this code of practice).

The RUC collector may vary or revoke an approval by giving notice in writing to the electronic system provider to whom the approval was granted.

To commence the approvals process, ESPs complete an application form and send it to Waka Kotahi.

This section of the code of practice gives guidance on how to meet the application requirements. Figure 1 provides an overview diagram of the process.

Costs

ESPs will be responsible for all costs associated with testing. ESPs will be advised of the cost before testing takes place, and will need to make payment before testing begins.

3.2 Becoming an agent of Waka Kotahi

An applicant needs to become an agent of Waka Kotahi to be authorised to issue RUC licences electronically. Waka Kotahi will provide an approval in principle and then check the applicant's electronic systems.

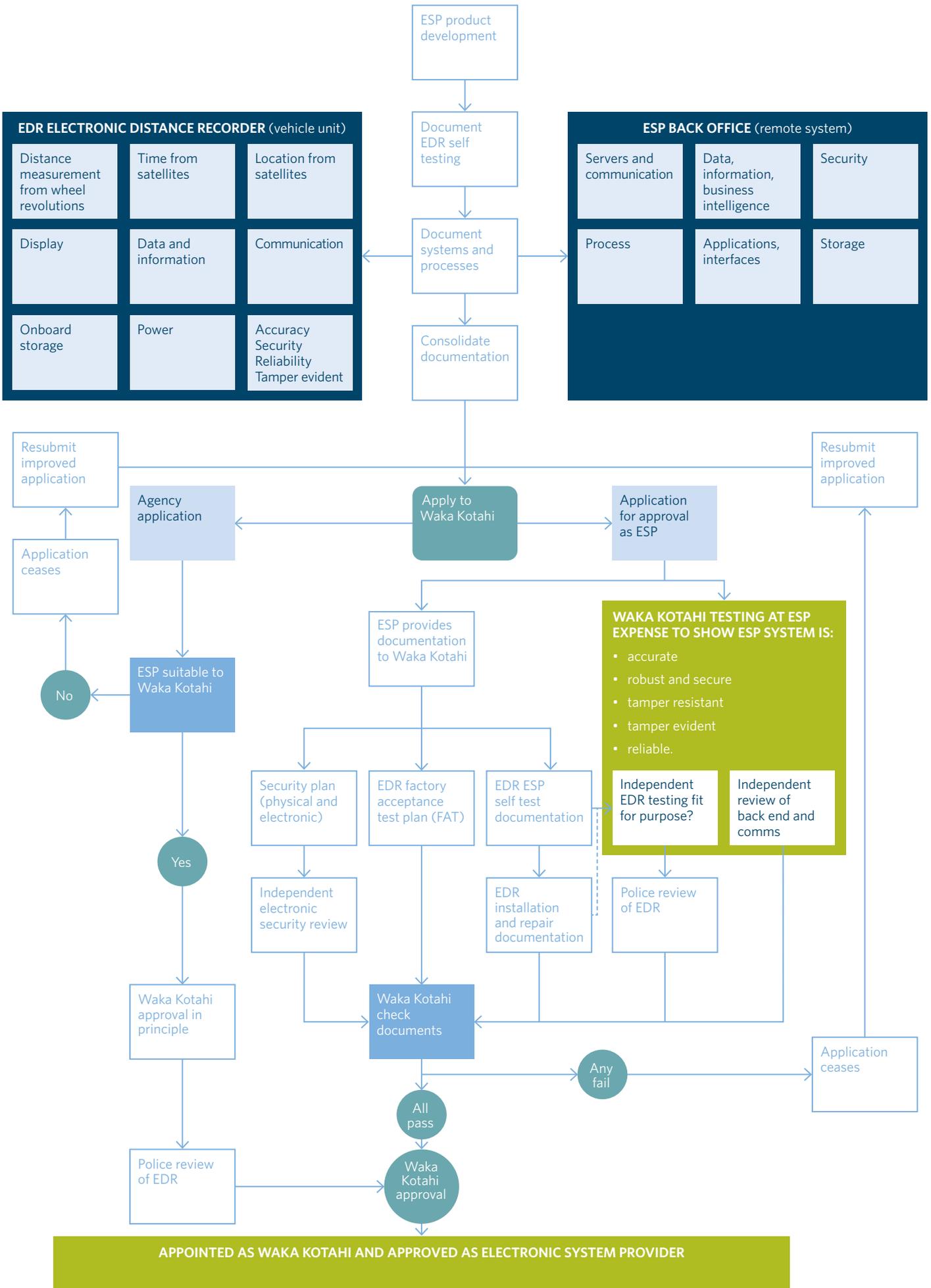
To register interest in becoming an agent of Waka Kotahi, the applicant must send a confidential business proposal to the Manager, Service Supply Management at Waka Kotahi (details in section 3.10: Waka Kotahi contacts).

The business proposal must include:

- a description of the corporate entity – background picture, strategic direction, financial overview (size, stability), customer base (numbers, size and types of organisations), and current services offered
- a description of the proposed service for administering RUC, including the business model, licensing process, and systems architecture
- an outline of the expected customer base and a qualified estimate of the number of RUC licences expected to be issued per annum
- a description of how the provision of this service will benefit the performance of the RUC system
- a nominated contact for any further discussions.

An authorisation to issue RUC licences electronically will be contingent on the security of the ESP's systems, integration with Waka Kotahi network, and the ESP's ability to perform the services of selling and issuing licences to the satisfaction of Waka Kotahi.

Figure 1: An overview of the ESP application process



3.3 Fitness for purpose

In general terms, being fit for purpose means that the electronic system should be of acceptable accuracy, reliability and security.

Further guidance on what is considered to be fit for purpose is provided in part 2 of this code of practice.

3.4 Waka Kotahi testing process

Self-testing

To demonstrate the accuracy and reliability of their system, ESPs will need to demonstrate that they have completed their own comprehensive testing and make the results available to Waka Kotahi.

Factory acceptance testing plan

To assist with independent testing of the electronic system, ESPs will need to design and supply a factory acceptance testing plan. This plan will be used as a starting point by Waka Kotahi; however, any tests may be undertaken that they deem appropriate to assess the suitability of the electronic system.

Independent security review

To ensure their electronic distance recorder and the rest of the system have an appropriate level of security, ESPs will need to develop a security plan covering electronic and physical security; they will also need to undergo an independent security review by an industry-recognised information systems security specialist. The contents of the report following this review must satisfy Waka Kotahi.

Aspects of this process may overlap with the requirements for becoming an agent of Waka Kotahi. ESPs will not be expected to duplicate the review requirements in such instances.

To prevent any loss of revenue that could result from adjustments to electronic systems, ESPs will need to explain to Waka Kotahi what protocols and restrictions are in place to prevent any alteration of the distance recorder reading – including the effect of any exceptions resolution undertaken by ESPs or their authorised installers and repairers and, when necessary, how ESPs will notify Waka Kotahi authorised representative.

Electronic system testing process

ESPs will need to provide at least three electronic distance recorders of the type and model for which they seek approval. In supplying these, ESPs accept that these electronic distance recorders may be damaged during the testing process. The electronic distance recorders will become the property of Waka Kotahi, though Waka Kotahi may return them by mutual agreement.

ESPs must also provide a simple user guide. The user guide must explain how their electronic distance recorder and electronic licence display function, including any fault identification.

As part of the testing process, ESPs will need to provide Waka Kotahi with authorised representative with appropriate access to evaluate the performance of the electronic system. ESPs will also need to provide access to all relevant data captured during the independent testing phase.

3.5 Police demonstration

In order to ensure that an electronic distance recorder and electronic licence display are fit for purpose, Waka Kotahi will provide the police with:

- a demonstration of a working model
- the user guide.

No recommendation for approval can be made until the police have confirmed to Waka Kotahi that they are satisfied with the electronic distance recorder and electronic licence display. Waka Kotahi will facilitate this process and will need to be contacted first to arrange a demonstration with the police.

This confirmation from the police cannot be used for any commercial purpose.

3.6 Installation and repair

ESPs will need to develop fitting, testing and repair specifications that can be provided to their authorised installers and repairers. ESPs will need to supply Waka Kotahi with a list of their authorised installers and repairers, and advise what access these parties will have to the electronic distance recorder and the rest of the system.

3.7 The decision

On completion of the Waka Kotahi testing process and a Police demonstration, Waka Kotahi will advise applicants whether they have been approved as an ESP.

3.8 Resubmission

An ESP may apply to become approved by Waka Kotahi but fail due to not meeting the requirements of Waka Kotahi and this code of practice.

Such a failure does not prevent the ESP submitting another application. Any additional costs for testing or approval incurred in doing so are payable by the applicant.

3.9 Confidentiality and non-disclosure agreements

An applicant and Waka Kotahi must complete mutual confidentiality and non-disclosure agreements.

3.10 Waka Kotahi contacts

To apply to become an electronic system provider, please contact:

Wayne Martin, Manager, Service Supply Management

Telephone: 06 953 6015

Email: wayne.martin@nzta.govt.nz

Post: Private Bag 11777, Palmerston North 4442.

For information about the approvals process for electronic system providers, please contact:

Bryan Talbot, Senior Technical Advisor, Regulatory Services

Telephone: 04 894 5062

Email: bryan.talbot@nzta.govt.nz

Post: Private Bag 6995, Wellington 6141.

Part 2:

Electronic system recommendations and requirements

4 Introduction to the eRUC information system

Part 2 describes an information systems approach and is intended to act as a guide to the system requirements for an electronic RUC system.

The recommendations and requirements are expressed as outcomes or outputs; however, in some instances suggestions on how this outcome might be achieved are provided.

Waka Kotahi will consider alternative methods to achieve the outcomes, especially if ESPs provide sound technical reasons. This is subject to demonstration that all legal requirements are met, and that Waka Kotahi business requirements and improved function can be achieved.

ESPs will be required to prepare or obtain a number of documents detailing how their information system is designed and how it operates. The intention of this code of practice is to encourage innovation and technological progress, while setting out legal requirements and other recommendations and requirements relating to business process and security.

4.1 System overview

There are four conceptual layers in the information systems approach, as drawn in figure 2, with a fifth section indicating the major user groups.

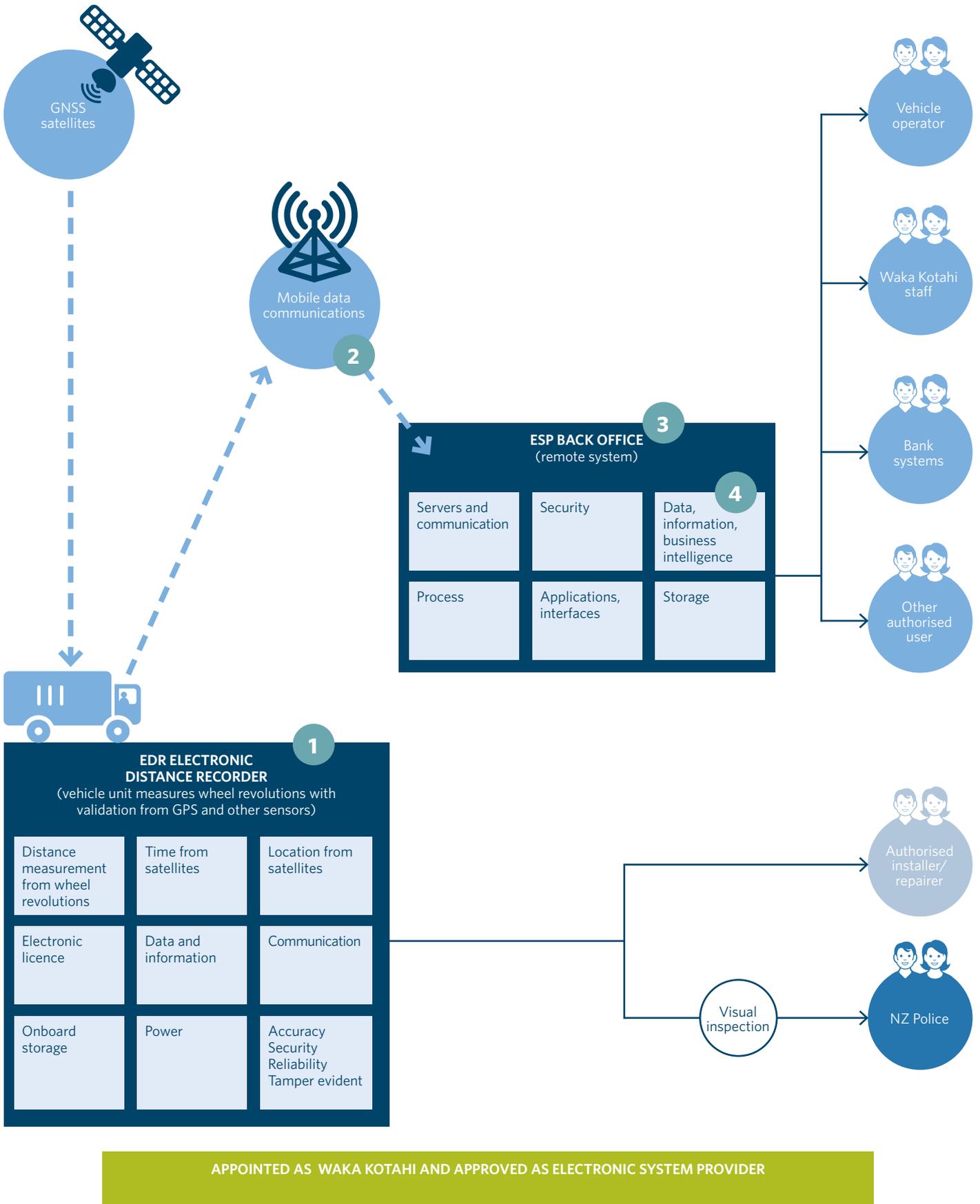
'Electronic distance recorder' (1) concerns the data capture and display functions of the electronic system fitted to the vehicle.

'Mobile data communications' (2) generally refers to mobile data communications between the electronic distance recorder and the rest of the system.

'ESP back office' (3) refers to a range of identified functions to be performed by the software applications that support the ESP's information system.

'Data, Information, Business Intelligence' (4) refers to the process of analysing data to support business and regulatory usage.

Figure 2: Conceptual layers applied to generic tracking system in current legal environment



5 Electronic distance recorder

The electronic distance recorder is a fit-for-purpose sub-system integrating a mix of hardware elements (including power, sensors, processors, memory, display/s and communications components, including any added after-market) and software that meets the functional requirements set out in the regulations.

5.1 Methodology recommendations

The distance recorded must be derived from at least two independent sources and cross referenced against each other. The sources may include, but are not limited to; wheel revolutions, GNSS and inertia subsystems.

A sample method for distance calculation is as follows:

1. The primary distance recorded should be derived from either, wheel revolutions, or, GNSS and validated by a second method.
2. Validating movement using an inertial subsystem.
3. Validating movement using the ignition (or similar) circuit.
4. Authenticating measured distances from steps 1 and 2 and validating them using steps 3 and 4 using a parameter and exception model.
5. Transmitting the distance determined to the back office (eg a part of the system that monitors RUC).

The electronic distance recorder should communicate all data to the rest of the system at the intervals described in the following section 'Recommended function'.

If the vehicle has been operating outside mobile coverage range, it should update the rest of the system immediately when it regains network coverage.

The priority for updates at any time when coverage has been lost and is regained should be:

1. exception reports
2. distance travelled
3. RUC licences
4. other data.

The electronic distance recorder should recognise any exceptions to any recommendation in this section of the code of practice, and return an exception notification to the rest of the system recording all exceptions in the ESP's exception register.

5.2 Recommended function

An electronic distance recorder should:

- record wheel revolutions or derivation of wheel revolutions as a method of accurately recording distance travelled
- gather positioning data (latitude and longitude) from a GNSS receiver using the WGS84 reference system and accurately determine distance travelled
- include an inertial subsystem housed within the electronic distance recorder to validate, and ideally estimate, the distance travelled
- cross-reference data from the above sensors and report an exception when significant variation is apparent
- display the electronic distance licence and distance travelled in accordance with section 19 of the Act and in the form prescribed in Schedule 2 of the Regulations (either as an integrated part of the electronic distance recorder, or on one or more separate electronic display panels)

- continue to accurately measure and record and be able to display the current distance travelled, irrespective of communications network coverage
- clearly indicate visually whether or not there has been a reported exception that is unresolved
- the distance displayed by the electronic distance recorder should be updated within 20 seconds of the vehicle becoming stationary
- transmit data to the rest of the system at least once every two minutes while the vehicle is moving (subject to mobile data communication network coverage)
- electronic distance recorder should transmit unit health at a minimum of once per month for a minimum of six months
- store all data that has not been received by the rest of the system
- ensure that all data captured from the vehicle is recorded to the memory of the electronic distance recorder and is erased only after the rest of the system confirms receipt of that data, or, in the case of a RUC licence, when a more recent licence is current and displayed
- continue to transmit all data in the event of any exception or tampering, unless the electronic distance recorder is tampered with to the extent that it is no longer capable of communication
- monitor any external inputs (wheel revolution, power, ignition etc), and create exceptions in the event of any alteration or tampering with the sensors, the connection between those sensors and the electronic distance recorder, or the communications medium
- transmit a description of any tampering and exceptions including power disconnection and low battery power to the rest of the system, sufficiently detailed for the ESP to correctly analyse the issue.

In the event of an exception, an electronic distance recorder should continue to record distance travelled, time, date, and the location and description of the exception.

Exceptions include:

- the wheel-revolution recorder or any other sensor failing to provide a reading
- the wheel-revolution recorder or any other sensor being damaged
- the wheel-revolution recorder being disconnected from the electronic distance recorder
- the case, distance calculator or any external sensors, feeds or related equipment (eg distance, ignition, or primary power supply) being tampered with
- any other occasion on which any part of the electronic distance recorder (internal or external) does not operate as designed and approved
- any attempt to penetrate, open or otherwise access or remove the case
- the data-validation process indicating an exception.

All recommended data should be captured by the electronic distance recorder. Basic data requirements and recommendations are listed in section 8.

It is desirable (but not essential) that an electronic distance recorder is able to store distance licences that have been purchased in advance but are not yet current.

5.3 Recommended form

An electronic distance recorder (including separate electronic licence display, if any) should:

- be housed in a secure, rigid and durable case or cases (enclosure) designed to:
 - › minimise the risk of unauthorised entry
 - › make any unauthorised entry visually tamper-evident
 - › report each entry electronically as an exception.

It may be possible to use more than one case provided that all cases meet the recommendations

- carry a brand name, model, version number, and unique serial number. These should be visible in a permanent format

Permanent format means not as part of the electronic display, eg on a metal plate securely fastened to the unit

- be secured to the vehicle in such a way that, under normal operating circumstances, the electronic distance recorder cannot be separated from the vehicle without creating an exception
- be permanently powered on
- include a continuous power supply
- contain an independent internal battery backup (housed within the case) with a minimum battery life of three months of normal operation without connection to any external power source
- indicate all tampering and exceptions including power disconnection and low battery power by readily apparent means on the electronic distance recorder
- be securely associated, either physically and/or digitally, to any external inputs
- include sufficient on-board memory to store six months of data (before transmission), in the event that communications or the rest of the system are unavailable.

5.4 Environmental performance recommendations

Electronic distance recorders should operate normally in the face of drops, shocks, vibration, humidity, altitude, rain, dust, sand, temperature extremes (-30°C to +80°C) and thermal shock. Testing to SAE J1455 is highly recommended. In cab mounted EDR's should comply with IP code rating IP54, the housing of externally mounted electronic distance recorders should comply with IP66 rating.

The ESP must provide assurance that:

- the electronic distance recorder will not interfere with other electronic devices or systems on or around the vehicle
- those devices or systems will not affect the operation of the electronic distance recorder.

5.5 Accuracy recommendations

The wheel-revolution distance (or its derivation) displayed should be within the range +/- 2% of the distance measured by a properly calibrated instrument at all times. This matches the Waka Kotahi test standard for mechanical hubodometers.

GNSS positioning should normally be within 5 metres of actual physical position, but allowances can be made for factors such as canyoning, loss of constellation, and outliers.

5.6 Electronic security

The electronic distance recorder should:

- have sufficient security mechanisms to mitigate the risks from physical and electronic tampering
- detect and electronically report physical and electronic tampering or inaccurate source data
- monitor external cables to ensure that data and power sources are direct and free from unauthorised adjustment, corruption or interference, detecting any alteration or tampering and reporting these as an exception
- adopt a methodology that ensures that data cannot be altered and that the source is authenticated during otherwise insecure two-way communications with the rest of the system. Waka Kotahi will approve a VPN (virtual private network) between the electronic distance recorder and the back office with a standard of encryption that has not been broken, or alternately will approve properly configured digital signing
- report any exception to the rest of the system and display an exception warning on the electronic distance recorder and display, until such time as the ESP clears that warning
- enable authenticated electronic identification of the electronic distance recorder as the data source.

The electronic distance recorder should enable exception reporting. Distance reporting and data transmission from the electronic distance recorder to the rest of the system should continue in the event that the case is open or another exception is reported. This alerts the information system that any data received may not be reliable while continuing to report exceptions and unconfirmed distance.

5.7 Physical security

The electronic distance recorder should:

- be designed in such a way as to be physically secure from any attempt to tamper with internal and external data capture points, components, wiring, electrical currents or electronic signals, and to recognise any such tampering as an exception
- be tethered to the vehicle in such a way that removing the electronic distance recorder (including the display) is not possible without reporting an exception
- be enclosed in such a way that accessing, adjusting or tampering with internal components is not possible without

penetrating or opening the case, and if the case is penetrated or opened, the electronic distance recorder should report an exception

- report any exceptions by all of the following methods: automatically indicate exception on each electronic distance recorder (and associated displays), transmit full details of each exception to any associated display and the rest of the system, and make any physical tampering evident.

5.8 Electronic licence display

The electronic licence display should (in addition to other electronic distance recorder recommendations):

- display the current RUC licence in accordance with the provisions of the Act and the Regulations
- meet the Act's requirement to produce the distance licence on demand.

ESPs are advised to obtain legal advice on the display requirements of the legislation.

6 Communications

Communications will occur between the electronic distance recorder and the rest of the system, and between that system and other parties.

Communications may also occur between devices on a vehicle (electronic distance recorders, input sensors, electronic display (where separate), and trailer sensors); and between electronic distance recorders and device maintenance tools.

In the current environment, the commercial mobile data network is the most common method of data communications between vehicles and the rest of the system. This does not preclude other options such as satellite.

6.1 Recommended function

Communications are required to transmit data effectively between different system components.

All communications networks and mobile data transmission should be continuously available. Network (round trip) latency should ensure delivery of all data to the destination within one minute of transmission. Confirmation of delivery should be received by the in-vehicle unit. Network coverage should be greater than 40% of the geographic area of New Zealand (calculated by land mass, not population). The telecommunications provider will need to confirm that these recommendations can be met.

6.2 Recommended form

Two-way wireless communications should be available to and from moving vehicles at all times while within range (coverage)

All internet communications should meet appropriate security standards (for example, HTTPS).

6.3 Physical security

All onboard communications equipment should be fully enclosed within the secure electronic distance recorder casing/s.

7 Back-office system

7.1 Methodology recommendations

The ESP's back office should continuously receive data from a variety of sources and process that data to accurately, reliably and continuously ensure correct payment for RUC licences for all distances travelled by any vehicles fitted with the ESP's electronic distance recorder.

The back office of the ESP's information system will typically consist of a number of functional services such as GNSS processing and correction, data validation (comparing recorded distance with GNSS calculation, inertial subsystem and any other data), administration and fee calculation, exception management, payments and licence-issue service, reporting to authorised users, and storage. The back office will also provide a range of interfaces between services, users and the electronic system, each requiring differing levels of security, data formats and specifications.

While figure 3 below illustrates the major components and functions, considerable further detail may be required and the final architecture may not resemble the illustration.

The back office is a highly vulnerable part of any information system. This is addressed in part by the recommendation for ESPs to prepare, maintain and update formal information system specifications and an information system management plan. ESPs should provide up-to-date versions to three authorised representatives of Waka Kotahi, check them as part of any internal review, and produce them for reference at the time of any audit of the ESP's information system.

7.2 Recommended function

Input: secure data.

Output: information tailored to various uses for each user group or user.

The ESP's back office should operate in near real time (updated within three minutes of any mobile data being logged by an electronic distance recorder, subject to mobile data coverage). The back office should be continuously available (greater than 99.75%). The back office should enable up-to-date checks at any time to verify RUC licence status, distance travelled, and the status of the electronic system.

The ESP's information system management plan should detail the system architecture, storage and archive measures, and any backup and disaster-recovery procedures.

7.3 Recommended form

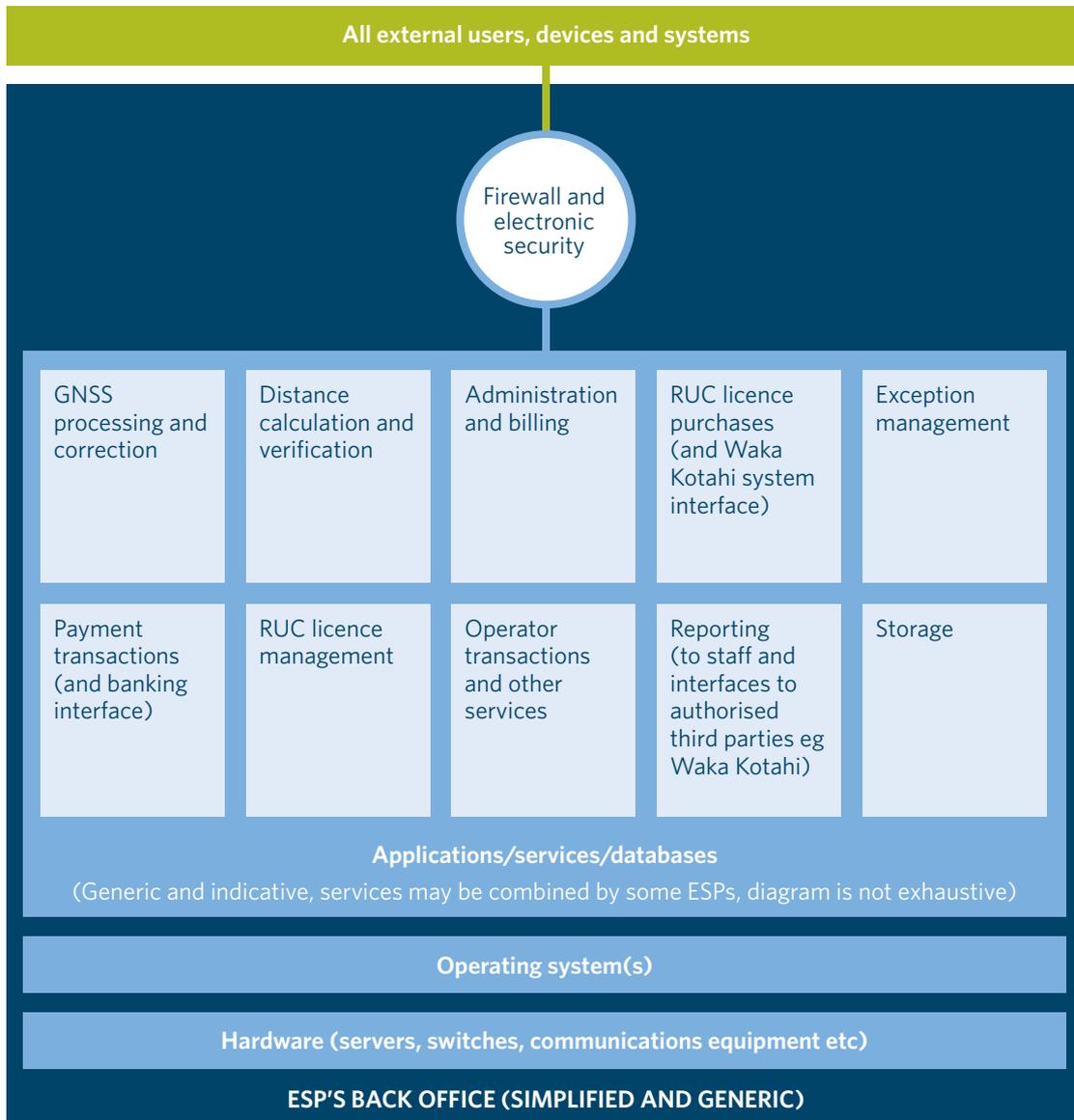
The ESP's back office should be remote from participating vehicles. However, some back-office functions may be performed partially or entirely in electronic distance recorders, or virtualised across other secure environments that meet information system recommendations.

The ESP's back office should provide storage of data for each vehicle for a minimum of seven years. Historical data (that which is not required for current operations) can be stored in an archive retrieval system provided it can be accessed with reasonable notice.

7.4 Accuracy and reliability specifications

The ESP's back office should operate in such a way that it processes with 100% accuracy all distance and location data received for each vehicle. These detailed records, or a summary approved by Waka Kotahi, should be held on record for a minimum of seven years.

Figure 3: Simplified illustration of major information system components in a generic back-office system



Changes to the data are only allowed if they increase its accuracy. Any changes must be tracked and recorded for the purposes of audit at a later date.

The ESP's back office should be continuously available (as defined above) to receive and process information from electronic distance recorders. ESPs are responsible for ensuring sufficient information system redundancy levels and power sources to ensure this outcome.

RUC licence purchases are not continuously available because of constraints in the current Waka Kotahi RUC system. An application for a RUC licence is lodged only

when entered into the Waka Kotahi RUC system.

7.5 Electronic security

The New Zealand Information Security Manual (NZISM) is published by the Government Communications Security Bureau. The NZISM provides up-to-date technical policy to assist government departments and agencies in securing information systems and the data stored in those systems. It defines requirements but does not define exact levels of security for specific situations.

Deliberate tampering with data is prohibited, and the ESP must implement suitable mechanisms to control access to any data and record any such access.

ESPs must:

- ensure that their back office is built using an industry standard methodology that restricts the level of user that is capable of changing data and ensures that a secure log records all alterations to data, the reason for those changes, and the user ID of the person making those changes. Each data source must be authenticated
- mitigate the risk of unlawful electronic access to any part of the system as far as is reasonably possible, using security levels, firewalls and other applications to prevent, limit, contain and report any intrusion attempts
- include adequate security protocols to ensure that the RUC licence details returned to ESPs from the Waka Kotahi RUC system cannot be altered before or during transmission to the vehicle
- include exception reporting from within their electronic systems and all other data feeds such that the type of exception can be determined precisely without physical inspection
- include an exception-handling process ensuring that every exception and resolution is notified, permanently recorded, and actioned appropriately within a timeframe approved by Waka Kotahi authorised representative
- ensure that their back office records the most recent time and location of any transaction with an electronic distance recorder.

7.6 Physical security

ESPs should develop a physical and electronic security plan to provide assurance that their security exceeds bank grade security, or is readily comparable to it. ESPs will be required to demonstrate during

the approval process that their system meets rigorous standards and that serious consideration has been given to preventing any exploits. The security plan should undergo a review by an independent security expert who is approved by Waka Kotahi authorised representative.

The ESP's back-office environment and information system should comply at all times with the approved security plan. The security plan should include as a minimum a physically secure environment for their back office, strict access control policy and monitoring (including an access control system with appropriate identification factors such as biometric factors), alarm activations, and exception notification and reporting.

Where third-party facilities are used, liability remains with the ESP, who should select and monitor these facilities appropriately.

7.7 GNSS processing and correction

GNSS positioning is relatively imprecise, and corrections are part of normal business process when reported positions do not correspond with previous and subsequent positions. The rules that ESPs develop or apply to correct GNSS derived data should be documented and available for audit at any time, whether they are applied to the electronic distance recorder or at the back office.

Any additional rules developed for correcting position inputs, or for reconciling position data against known road classifications and locations, should also be documented and available for audit at any time.

ESPs must record all data corrections that are made and the reasons for making them, and make them available for audit.

The ESP's system should comply at all times with the documented recommendations covered in the previous two paragraphs.

7.8 Administration and billing

Administration and billing are internal functions which depend on other parts of the information system. These functions should not expose ESPs to any additional security issues.

7.9 Payment transactions

Payment transactions involve an interface with the banking system, and compliance with banking system requirements is likely to be considered sufficient for this function.

7.10 Exception management

ESPs should maintain an exception register in electronic form, investigate every exception report, and record authenticated responses from vehicle operators. The exception register shall include:

- an entry for each identified exception and non-compliance
- detail of the exception or non-compliance
- the corresponding time, date, location, vehicle and vehicle operator
- the time and date the vehicle operator was notified
- the ESP's resolution
- whether or not Waka Kotahi authorised representative was notified.

7.11 RUC licence purchases

The ESP's system is required to include a Waka Kotahi interface to permit purchase and display of RUC licences via the Waka Kotahi RUC system.

7.12 Operator transactions and other services

ESPs may provide additional services to their customers using the electronic system. Provision of these services should not expose the ESP or the customer to any additional security issues.

The vehicle operator remains liable for ensuring that a new licence has been purchased, even when a vehicle is outside coverage. Therefore, the vehicle operator should be able to access the ESP's information system to purchase new distance licences in the event that the vehicle is outside coverage for an extended period.

The vehicle operator should be able to carry out all other current licence-purchase functions.

The ESP's back office should record any successful and unsuccessful attempts to purchase a RUC licence or electronically deliver a RUC licence to the electronic system. In the event of a failed purchase attempt, the customer should immediately be made aware of the failure so that they know that the transaction has not occurred.

7.13 Off-road refunds

An ESP may provide a service to assist in off-road refund claims. This may include providing reports to identify relevant distances or preparing the claims directly. The information in this Code of Practice about location standards and recommendations is designed to assist in the provision of this service. The customer remains responsible for the accuracy of claims.

7.14 Storage

Storage should be configured to minimise data loss in the event of catastrophic system failure or total power failure.

8 Data and information

The key considerations in system and data architecture are that all data should be highly accurate, reliable, traceable to source, and wherever possible validated and authenticated.

Data is the raw ingredient collected from each source. Data is gathered and placed in context to develop meaningful information.

Reference to the data listed below shows that the RUC system does not require or contain any personal information.

8.1 Requirements and recommendations

The minimum data requirements are listed in figure 4 below. Waka Kotahi may change these requirements.

It is important to note that the following list should be considered as a minimum starting point rather than a constraint on the ESP's data architecture. A flexible system with the capacity to manage additional parameters may be an advantage.

This list currently excludes metadata and data related to other external systems such as the banking system.

Data will be collected from a range of sources.

Figure 4: eRUC data schema

Data	Format	Source	Comment	Capture interval & accuracy
Distance run	km	Electronic distance recorder, derived from wheel revolutions and validated by other sensors	Primary distance data	Continuous minimum display interval 100m. Should be accurate to within +/-2% at all times
Electronic distance recorder date and time	hh:mm dd/mm/yy	Electronic distance recorder system time	Recommended to be automatically calibrated against GNSS time to maintain system consistency	Should continuously update and should always be calibrated within +/- 1 second of NZ standard time (GMT +12), or adjusted for daylight saving when relevant
GNSS location and time	X Y (WGS84 datum) hh:mm dd/mm/yy GMT Number of satellites used for position Dilution of precision (DOP) of the position	Position information derived from GNSS satellites GNSS timestamp	Used for validation of electronic distance recorder distance run and time in conjunction with inertial subsystem	Latitude/ Longitude position of the vehicle. Resolution should be 0.00001 degrees (approx 1m) or better. A NULL value should indicate no GNSS satellites available or the system unable to obtain vehicle position
Ignition on/off (or other engine running sensor)		Electronic distance recorder	Used for validation of movement and minimum reporting intervals	

Data	Format	Source	Comment	Capture interval & accuracy
Electronic distance recorder ID and make	Unique device ID	Electronic distance recorder	Must be unique ID, independent of number plate but associated with the vehicle (device make and serial number)	Once only, but must be physically verified following any tamper exception
Exception or normal	Alarm	Electronic distance recorder	Indicates any exception on the electronic distance recorder and identifies the issue in the back office until resolved by the ESP	Only on exception but must be completely accurate
Low power	Alarm	Electronic distance recorder	Identifies if the primary power source has been disconnected or the internal battery is low	Only on exception but should be completely accurate
Vehicle registration number	Up to 6 alpha-numeric characters	Electronic distance recorder installer must confirm association between the electronic distance recorder ID and registration number	Must be permanently associated with the electronic distance recorder ID	
On/off-road	On/off Method used to derive on/ off-road	Derived – refer to on/off-road type	May be obtained from road centre line and width data, geofencing, publicly recorded data about legal ownership of land (cadastral data), or other such combination as currently approved or specified by Waka Kotahi	
Back-office time and date	hh:mm dd/mm/yy	Back-office system time	Must be automatically calibrated against GNSS time to maintain consistency	Must continuously update and must always be calibrated within +/- 1 second of NZ standard time or the daylight saving adjustment
RUC licence vehicle type	3 digits	Waka Kotahi RUC system	As described in the Regulations	Permanently associated with the vehicle
RUC licence weight	Up to 3 digits	Waka Kotahi RUC system		Currently nominated per 1000km for distance licences
RUC licence serial number	Up to 10 alpha-numeric characters	Waka Kotahi RUC system	Currently only numeric	
RUC licence type	Distance or additional	Waka Kotahi RUC system		

Data	Format	Source	Comment	Capture interval & accuracy
Electronic distance recorder serial number documented on RUC licence	Up to 10 alpha-numeric characters	Waka Kotahi RUC system	Must correspond precisely with electronic distance recorder ID	
RUC licence minimum and maximum distances	6 digits	Waka Kotahi RUC system		

8.2 Security

ESPs must take all reasonable steps to ensure:

- the security of access to their information (both electronic and physical security)
- the integrity of their information
- the accuracy of their information.

ESPs must document their policies, processes and controls for this. The policies, processes and controls must be sufficient to prevent unauthorised access.

ESPs must document their compliance with the policies and processes. They must make the documentation available for audit.

8.3 Road network dataset

A road network dataset is a digital representation of the road network that assists location-based solutions like the collection of electronic road user charges.

A number of road network datasets are available from commercial data providers. Waka Kotahi will not provide an endorsement for any provider of road datasets, nor will Transport Agency mandate that one data provider should be used as part of the collection of electronic road user charges.

The ESP is responsible for selecting a suitable road network dataset that meets their requirements and the requirements of their clients.

8.4 On-road versus off-road travel

The ESP is responsible for calculating on/off-road travel to meet their client's requirements in a way that satisfies the RUC collector.

Waka Kotahi has a process for managing RUC refunds for off-road travel. The process is described at: <http://www.nzta.govt.nz/vehicles/licensing-rego/road-user-charges/ruc-licences/ruc-refunds/>.

Part 3:

Terms and conditions that Waka Kotahi may apply

9 Terms and conditions of approval

The following provisions indicate the terms and conditions that are likely to accompany the RUC collector's approval. The wording of the actual terms and conditions may differ slightly. Waka Kotahi reserves the right to impose provisions in addition to those outlined below.

9.1 Company requirements

Approval will be given only to a registered New Zealand company with at least one company director residing in New Zealand.

9.2 Cost of compliance

ESPs are responsible for complying with their obligations under the approval, and must bear all their costs of doing so.

9.3 Approval given for specific device and system

An applicant must specify the make and model of the electronic distance recorder that is the subject of any application for Waka Kotahi approval as an ESP.

Approval as an ESP is subject to the ESP applying separately to Waka Kotahi and receiving approval for:

- each new hardware model with a material change in componentry
- any substantial software or firmware change to the parameters of an electronic distance recorder or electronic licence display that may affect its accuracy or functionality
- an information (licence application) system which interfaces with the Waka Kotahi Landata system and the signing of a service delivery agreement.

9.4 Change management

In the event of any changes to the ESP's information system that may affect the back-office interface with the vehicle operator, with the electronic distance recorder or with other authorised remote users, ESPs agree to:

- notify the Waka Kotahi authorised representative of any significant changes to the electronic system
- maintain a change management register that records the reason for the change, relevant application/s, testing conducted, date and time implemented, version number, Waka Kotahi notification and impact of every change. The register must be in a format approved by the Waka Kotahi authorised representative and must be made available to Waka Kotahi authorised representative on request
- advise the Waka Kotahi authorised representative at least seven days in advance of any firmware or software upgrade unless the nominated Waka Kotahi representative specifically authorises an urgent upgrade. The advice must include the reason, date, time, version number and impact of every upgrade
- advise the Waka Kotahi authorised representative within one working day if any implemented change affects the ESP's information system in any way that was not anticipated
- notify the Waka Kotahi authorised representative of any significant changes to the electronic system

- accept liability for the cost (if any) of any changes to the ESP's information system that are necessary to conform to revised interface specifications required by Waka Kotahi or other providers of services interfacing with their information system.

Waka Kotahi reserves the right to require system testing at the ESP's expense if, in the opinion of Waka Kotahi authorised representative, any upgrade to any part of their information system could affect the security or accuracy of data, of data transmission, of the data capture device, or of any associated display or payment. Communications firmware upgrades are highly unlikely to have such an effect.

9.5 Business process audits

ESPs agree to permit Waka Kotahi authorised representative at any time to audit, observe, test or inspect:

- the equipment, any part of the ESP's information system, and the location or any site at which any activity or work is carried out for the ESP or on their behalf
- the ESP's records, including business process documentation, exception logs and any other information relating to the functions carried out under the service agreement and the applicable law.

9.6 Conditions for fitting electronic distance recorders to vehicles

Only ESPs, or an installer they have authorised, shall fit an electronic distance recorder to a vehicle. This must be carried out in accordance with the ESP's fitting and testing specifications and records must be kept to confirm compliance for each vehicle installation. These records must be available to the Waka Kotahi authorised representative on request.

9.7 Conditions for repairing or modifying electronic distance recorders

Only ESPs, or a repairer they have authorised, shall repair or modify, or attempt to repair or modify, any part of an electronic distance recorder in any way. This must be carried out in accordance with the ESP's repair specifications, and relevant records (including exception records) must be completed.

9.8 Customer relations

ESPs must provide support to their customers for faulty or damaged distance recorders.

In the event that ESPs discontinue the provision of RUC services to a customer, they must notify the Waka Kotahi authorised representative that the customer is no longer using their RUC services, following protocols agreed with the Waka Kotahi authorised representative.

ESPs must have a discontinuation protocol, approved by the Waka Kotahi authorised representative, which ensures that:

- the customer is not prevented from complying with their obligations under the Act by any action that the ESP takes
- the electronic distance recorder continues to record distance and location and display the distance recorded, as well as transmitting that data to the rest of the system, until such time as it is removed from the vehicle/s, or until the ESP is advised by the Waka Kotahi authorised representative that they may discontinue this function
- copies of all information held on the customer's behalf specific to the provision of RUC services, including distance recording, are delivered to the customer.

9.9 Systematic exception reporting

ESPs must maintain an exception-reporting system that includes a log of every exception report and the investigation and authenticated responses from vehicle operators.

ESPs must report to the Waka Kotahi authorised representative any exception that carries the risk of loss of revenue to the Crown (such as suspicious or systematic exceptions) along with any associated authenticated responses from vehicle operators.

In the event that an ESP reports a suspicious or systematic exception, they will grant Waka Kotahi access to all records they hold relating to the event.

9.10 Management of data and records

The ESP's back-office systems must store all data relating to the provision of RUC services for a minimum of seven years. If their approval lapses, the ESP must deliver to the customer copies of distance recording and all other information they hold on the customer's behalf specific to the provision of RUC services.

9.11 Access to aggregate information

ESPs must provide anonymous aggregate traffic or transport information from their clients to the RUC collector upon request.

ESPs must provide this information at reasonable cost, in a format specified by the RUC collector.

9.12 Termination, variation, or revocation of approval

The service agreement for each ESP defines the conditions and processes for termination, variation, or revocation of approval.

Appendix 1: Glossary

The terms in this glossary are used in this code of practice with the meanings given below.

ACT	The Road User Charges Act 2012.
AUDIT	An inspection to determine a party's capacity to meet, or continue to meet, initial and ongoing service delivery requirements set by the RUC collector. This includes any visual, physical, mechanical, electrical, or electronic inspection, or combination of these, as determined by the auditor.
AUTHENTICATION	Confirmation that something is what it claims to be and cannot be something else.
AUTHORISED REPRESENTATIVE	Any person authorised by the RUC collector either in writing or by warrant to perform a specific audit task and includes any enforcement officer as described by the Land Transport Act 1998.
BACK-OFFICE SYSTEM	All hardware, operating system/s software application, data and other parts of the information system used to collect and process data from one or more electronic distance recorders, their associated vehicle operators, Waka Kotahi and other parties.
DILUTION OF PRECISION (DOP)	A measure for a determination of position (latitude and longitude), quantifying the quality of the determination based on the number and geometric distribution of the satellites used.
ELECTRONIC DISTANCE RECORDER (EDR)	A distance recorder provided by an electronic system provider. (Source: section 5, Road User Charges Act 2012)
ELECTRONIC LICENCE	A licence displayed electronically on, or in conjunction with, an electronic distance recorder. (Source: section 5, Road User Charges Act 2012)
ELECTRONIC SYSTEM	A system involving the use of electronic equipment and other technology situated in, or fitted to, a RUC vehicle and elsewhere that has the capacity to measure, monitor, collect, store, display, analyse, communicate, and report information relating to: <ul style="list-style-type: none"> (a) the identity, distance travelled by, and location of a RUC vehicle, and (b) the purchase and issue of an electronic licence for the RUC vehicle, and (c) the integrity, security, and normal operation of the system. (Source: section 5, Road User Charges Act 2012)
ELECTRONIC SYSTEM PROVIDER (ESP)	A person approved by the RUC collector under section 43 to: <ul style="list-style-type: none"> (a) provide electronic distance recorders, and (b) issue electronic licences. (Source: section 5, Road User Charges Act 2012)
EMPLOYEE	Any person who is engaged to work, or works, under a contract of service or a contract for services. (Source: section 2, Public Audit Act 2001)

EXCEPTION	Any occasion that any part of the information system is not operating normally or within agreed parameters (as designed or expected). Exceptions include an electronic system 'fail' and, for example, any 'off-road geofences' or 'off-road claims' situated on public property and any private property that is owned by a public organisation.
FACTORY ACCEPTANCE TESTING	Testing of electronic distance recorders to demonstrate that all avenues of system tampering have been satisfactorily addressed and the electronic distance recorder is capable of operating to specification.
FAIL	In relation to an electronic system: (a) means a failure of the system to perform as intended in terms of accuracy, security, reliability, verifiability, or any other performance indicator, and (b) includes a permanent failure, a temporary failure, or the failure of the system on a particular occasion or in particular circumstances. (Source: section 5, Road User Charges Act 2012)
FIRMWARE	The programs and data structures that internally control an electronic device.
GEOFENCE	A virtual perimeter around a geographic area, established so that when a specific electronic distance recorder enters or exits the area, the event is recorded.
GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSS)	A positioning system such as the US NAVSTAR Global Positioning System (GPS), the Russian GLONASS system, the European Galileo system, the Chinese Beidou/Compass system or India's IRNSS system.
INERTIAL SUBSYSTEM	A device, or collection of devices, that measures acceleration forces, such as an accelerometer.
IGNITION SENSOR	A sensor that can determine whether or not the ignition circuit of a vehicle is in the power-on or power-off state.
INFORMATION SYSTEM (IS)	An electronic system for producing, sending, receiving, storing, displaying, or otherwise processing electronic communications. For the purpose of an electronic system provider an information system includes all electronic distance recorders, all other hardware, software applications and related systems, services, data and communications.
INFORMATION SYSTEM MANAGEMENT PLAN	A plan that details the operational management procedures to follow policy defined by an electronic system provider to effectively meet all the Waka Kotahi requirements and other system objectives. This should include consideration of system architecture, exception handling, backup, continuity of service, disaster recovery and other considerations.
INFORMATION SYSTEM SPECIFICATIONS	Description of the core requirements for ensuring adequate data-management capability. Waka Kotahi requires assurance that an information system considers, includes and correctly processes data for all required RUC functions.

INTERFACE	A set of defined operations that can be invoked by clients of the electronic system provider's information system.
INTERNAL REVIEW	A review arranged by an electronic system provider to ensure that their information system continues to comply with the code of practice and other RUC collector requirements.
METADATA	Structured information that describes, explains, locates, or otherwise makes it easier to retrieve, use, or manage an information resource. Metadata is often called data about data.
NON-COMPLIANCE	A deficiency in the content, documentation or implementation process of an electronic system provider's information system that means it does not fulfil a term or condition of their approval.
ON-ROAD	Any place a vehicle is driven that is maintained by public funds – by default this includes all publicly owned land. (Source: section 30, Road User Charges Act 2012)
OFF-ROAD	Any place a vehicle is driven that the RUC collector is satisfied is not maintained by public funds – by default this includes all privately owned land. (Source: section 30, Road User Charges Act 2012)
PUBLIC FUNDS	Any central government, Waka Kotahi or local government funds used to maintain public roads, berms, drains and road reserve. (Common law meaning)
PUBLIC ORGANISATION	Any organisation that uses public funds to maintain roads. (Common law meaning)
REGULATIONS	The Road User Charges Regulations 2012.
ROAD	Either of: (a) a highway (whether or not it has been declared to be a state highway) and (b) a street. (Source: section 5, Road User Charges Act 2012)
ROAD USER CHARGES (RUC)	Charges payable under the RUC Act in respect of the distance travelled by a RUC vehicle on a road. (Source: section 5, Road User Charges Act 2012)
RUC COLLECTOR	Waka Kotahi is appointed by an Order in Council made under section 87 of the RUC Act to be the RUC collector for the purposes of the Act. (Source: section 5, Road User Charges Act 2012)

RUC INFORMATION	<p>(a) Means information that is generated or collected by an electronic system provider for any purpose relating to the provision, by the electronic system provider, of services relating to road user charges, and</p> <p>(b) includes information relating to:</p> <p>(i) the identity and business address of a person who is operating a RUC vehicle and the name of the person who has purchased a RUC licence for a RUC vehicle</p> <p>(ii) the distance travelled by a RUC vehicle</p> <p>(iii) the location of a RUC vehicle for the purpose of verifying a refund for off-road travel</p> <p>(iv) the purchase of a RUC licence</p> <p>(v) a fault with an electronic distance recorder or tampering (including suspected tampering) with an electronic distance recorder.</p> <p>(Source: section 5, Road User Charges Act 2012)</p>
SECURITY PLAN	The document prepared by an electronic system provider detailing all physical and electronic measures to ensure the information system and information system environment are fit for purpose.
SERVICE DELIVERY AGREEMENT	The contract between Waka Kotahi and an electronic system provider for the provision of RUC licensing services.
TAMPER	<p>In relation to an electronic system, means:</p> <p>(a) engage in conduct that results in, or is likely to result in:</p> <p>(i) the system being altered, or</p> <p>(ii) the system or any part of the system being used in a way that is not in accordance with the terms and conditions of the electronic system provider's approval under section 43, or</p> <p>(iii) any road user charges data that the system uses internally being altered, or</p> <p>(b) engage in conduct with the intention of causing the electronic system to:</p> <p>(i) fail to collect RUC information, or</p> <p>(ii) fail to record distances travelled by a RUC vehicle correctly, or</p> <p>(iii) fail to store or report RUC information or to store or report RUC information correctly.</p> <p>(Source: section 6, Road User Charges Act 2012)</p>
VALIDATION	A check to confirm whether data corresponds with defined criteria. This provides a level of certainty that the data is correct and eliminates data that is clearly not correct.
VEHICLE OPERATOR:	The driver, operator, or owner of a vehicle as individually defined by section 2(1) of the Land Transport Act 1998; including the holder of any transport service licence.

VIRTUAL PRIVATE NETWORK (VPN)	A computer network that is implemented in an additional software layer (overlay) on top of an existing larger network for the purpose of creating a private scope of computer communications or providing a secure extension of a private network into an insecure network such as the internet.
WAKA KOTAHI	Waka Kotahi NZ Transport Agency.
WAKA KOTAHI RUC SYSTEM	The Waka Kotahi computer equipment, telecommunications equipment, software and Landata database management system.
WGS84	The World Geodetic System (WGS) is a standard for use in cartography, geodesy, and navigation. It comprises a standard coordinate system for the earth, a standard spheroidal reference surface (the datum or reference ellipsoid) for raw altitude data, and a gravitational equipotential surface (the geoid) that defines the nominal sea level.

Appendix 2: Key performance indicators for reporting

Area	Performance attribute and business reason	Key performance indicator
SERVICE DELIVERY	<p>1. Reporting</p> <p>Reason: to provide the RUC collector with assurance of service delivery levels.</p>	<p>Electronic system provider reports must be delivered electronically to the authorised representative within timeframes as specified:</p> <ul style="list-style-type: none"> Reporting on all key performance indicators every 6 months. Change management records (as described in the requirements) must be recorded and sent to Waka Kotahi prior to each change being tested and implemented. Where change management records (as described in the requirements) must be recorded and sent, this may be done electronically. Waka Kotahi must have visibility of the change register as it relates to RUC.
	<p>2. Fault detection, response and resolution</p> <p>Reason: to provide the RUC collector with assurance of fault correction.</p>	<ul style="list-style-type: none"> Number of electronic distance recorders fitted nationally over the period. Number of exceptions reported in period broken down by product fault, tamper or other (details required).
	<p>3. Electronic system availability</p> <p>Reason: to provide the RUC collector with assurance of system availability.</p>	<ul style="list-style-type: none"> Electronic distance recorders must be available 100% of the time. Average customer facing electronic system availability of 99.75% is required. Excludes any unavailability of Waka Kotahi systems.
	<p>4. Electronic distance recorder reliability</p> <p>Reason: to provide the RUC collector with a measure of electronic distance recorder reliability and detected faults and tampers, enabling further investigation at operator level if required.</p>	<ul style="list-style-type: none"> Number of hardware exceptions. Number of repairable hardware faults in service.

Area	Performance attribute and business reason	Key performance indicator
EDRs	<p>5. Exceptions detected</p> <p>Reason: to provide the RUC collector with assurance that service providers are reporting similar percentages of exceptions.</p>	Maintenance of an up-to-date exception register.
CUSTOMER SATISFACTION	<p>6. Customer satisfaction</p> <p>Reason: to assure the RUC collector that agents are providing good credible service and are engaging with Waka Kotahi customers using sound business practice.</p>	Level of satisfaction of customers, as measured by the RUC collector.
	<p>7. Complaints</p> <p>Reason: to assure the RUC collector that agents are providing good credible service and are engaging with Waka Kotahi customers using sound business practice.</p>	<p>Number of complaints received, using the following categories:</p> <ul style="list-style-type: none"> ▪ Projects ▪ Decisions ▪ Policy ▪ Communication (information unclear or incorrect) ▪ People ▪ Service delivery
SECURITY	<p>8. Electronic system</p> <p>Reason: cyber attacks are likely whenever revenue is involved. Provides the RUC collector with a measure of these.</p>	<ul style="list-style-type: none"> ▪ Security breaches detected. ▪ Security breaches reported to Waka Kotahi. ▪ Any revenue, data loss, or risk of such loss (to unauthorised parties) must be reported to the authorised representative of the RUC collector within one business day.



If you have further queries, call our contact centre on 0800 699 000 or write to us:

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