

TCS 071 - 2019

Specification for

The Supply and installation

of

Side Road Activated Speeds (SRAS)

December 2019
Version: Revision B



Department
of Transport

Foreword

This specification has been developed by Department of Transport (DoT). It is one of a number of technical specifications, and associated standard drawings, which set out the requirements for roadside ITS devices, traffic signal equipment and other electrical equipment and associated devices and control systems.

This specification is intended for use in all relevant works undertaken by or on behalf of DoT.

DoT Standard Drawings, Specifications and Guidelines are available for downloading from the VicRoads website: <https://www.vicroads.vic.gov.au/business-and-industry/technical-publications/electrical-and-intelligent-transport-systems>

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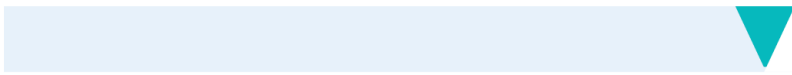
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Specification updates. DoT specifications and associated standard drawings are subject to periodic review. To keep the specifications up to date, amendments or new editions are issued as necessary. It is therefore important for users of DoT specifications to ensure that they have the latest version and associated amendments.

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Revision History

Version	Revision	Date	Author	Description
2019	A	March 2019	ITS	New specification
2019	B	December 2019	ITS	Specification Update

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SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

- 1.1.1 This specification covers the manufacture, operation and installation of Side Road Activated Speeds (SRAS) systems, intended for use on high risk areas on rural roads intersections, particularly where smaller side roads intersect with main roads.
- 1.1.2 This specification is not intended to cover the requirements or operation of ESLS used as part of school speed zone treatments, strip shopping centre treatments and Lane Use Signs (LUS). The requirements for these are outside the scope of this specification and are available in other specifications.

1.2 GENERAL

- 1.2.1 Vehicles on side roads approaching high risk intersections will trigger an electronic speed limit sign on the main road, typically reducing the speed limit by up to 30 km/h.
- 1.2.2 This reduced speed limit will be active for as long as there are vehicles waiting to enter or cross the main road.
- 1.2.3 Electronic Speed Limit Signs (ESLS) are used to display a legally enforceable speed limit to be adopted at different times. Any reference to “sign” within this document shall be taken to mean “Electronic Speed Limit Sign”.
- 1.2.4 ESLS provided as part of a SRAS system are required to meet the requirements of TCS 037 “Specification for the Supply of Electronic Speed Limit Signs”.
- 1.2.5 All ESLS shall be Type Approved as detailed in Appendix D.
- 1.2.6 Individual tender documents shall detail the speeds and sizes of signs required for a specific project.
- 1.2.7 Where default posted speed limits are 90 km/h or above, size C signs with respect to TCS 037 and AS 1743 shall be used.
- 1.2.8 When displaying the reduced speed, the annulus shall flash in accordance with Section 5 of TCS 037.
- 1.2.9 ESLS used for Side Road Activated Speed systems shall be single speed discrete character or single speed matrix (programmed with the SRAS system speed limit only).

1.3 INTELLECTUAL PROPERTY

1.3.1 In relation to all Intellectual Property used in/or to operate the system, the contractor grants to DoT non-exclusive licence to “use, modify and/or sell” or do anything else that without the licence, could be breach of the licensors Intellectual Property.

1.3.2 Intellectual Property shall include, but not be limited to, the following:

- Software.
- Source code(s).
- Schematic diagrams.
- Circuit diagrams.
- Wiring diagrams.
- Listings of components and sub-components.
- Any and all operational and maintenance documentation.

1.4 ACRONYMS

The acronyms used in this document shall be interpreted as follows:

ACMA	Australian Communications and Media Authority
AS	Australian Standard
CLI	Command Line Interface
DoT	Department of Transport
ELV	Extra Low Voltage
EMC	Electromagnetic Compatibility
FP	Field Processor
GPS	Global Positioning System
GNSS	Global Navigation Satellite System
HTTPS	Hypertext Transfer Protocol Secure
ICMP	Internet Control Message Protocol
IP	Ingress Protection (degree of protection)
ITS	Intelligent Transport System
LED	Light Emitting Diode
LUS	Lane Use Sign
LUMS	Lane Use Management System
NTP	Network Time Protocol
NZS	New Zealand Standard
RCD	Residual Current Device
SDI	Simple Device Interface
SNMP	Simple Network Management Protocol
SSH	Secure Shell
SSL	Secure Sockets Layer
STREAMS	An ITS communications/control platform used by Department of Transport to manage traffic operations on freeways
TCP/IP	Transmission Control Protocol/Internet Protocol
TLS	Transport Layer Security

SECTION 2 RELATED SPECIFICATIONS AND DRAWINGS

2.1 AUSTRALIAN STANDARDS

2.1.1 The fabrication and supply of all components shall conform to the latest version of all relevant Australian Standards.

2.1.2 Where no specific reference is made to an Australian Standard, the materials and processes used shall conform to the relevant Australian Standard or generally accepted practice.

2.1.3 The following related Australian Standards are referenced:

AS/NZS 1170.2	Structural design actions - Wind actions
AS 1743	Road signs - Specifications
AS/NZS 3000	Electrical Installations
AS/NZS 3100	Approval and test specification - General requirements for electrical equipment
AS 4086.1	Secondary batteries for use with stand-alone power systems - General requirements
AS 4086.2	Secondary batteries for use with stand-alone power systems - Installation and maintenance
AS/NZS 4509.2	Stand-alone power systems - System design
AS/NZS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS 5156	Electronic speed limit signs
AS 60038	Standard voltages
AS 60529	Degrees of protection provided by enclosures (IP code).
AS IEC 62619	Secondary cells and batteries containing alkaline or other non-acid electrolytes — Safety requirements for secondary lithium cells and batteries, for use in industrial applications
AS/NZS 61000.6.1	General Standards – Immunity for residential, commercial and light industrial environments
AS/NZS 61000.6.3	General Standards – Emission standard for residential, commercial and light industrial environments

2.2 DOT SPECIFICATIONS AND DRAWINGS

- 2.2.1 All installation works shall conform to the relevant DoT specifications and related specifications and standards as indicated throughout this document.
- 2.2.2 The fabrication and supply of all components shall conform to the relevant DoT specifications, and related specifications and standards, as indicated throughout this document.
- 2.2.3 The following DoT documents are referenced:

Standard Section 732	Installation of ITS Devices
Standard Section 733	Conduits and Pits for Underground Wiring and Cabling
Standard Section 736	Integration of ITS Devices and systems
TCG 016	Product Compliance Process for ITS and Electrical Products
TCS 037	Electronic Speed Limit Signs
TCS 043	Specification for the Supply of Electrical Distribution Cabinets
TCS 054	Specification for the Installation of Inductive Detector Loops
TC-1320	Detector Pit Installation details
TC-2032	Loop Installation Details – Freeway Data Station
TC-2100	Standard Cabinet Label
Technical Alert - Road and Traffic Design	Locations of ESLs and Side Road Detection for Side Road Activated Speeds (SRAS)

2.3 ADDITIONAL SPECIFICATIONS AND DRAWINGS

- 2.3.1 The fabrication and supply of all components shall conform to the following specifications and drawings as indicated throughout this document.
- 2.3.2 The following additional documents are referenced:

Transmax	STREAMS Modbus Interface for Simple Devices Device Technical Guide
Transmax	STREAMS Modbus Interface for Simple Devices Device Product Guide

SECTION 3 OPERATION AND CONTROL

3.1 GENERAL

3.1.1 Each SRAS system shall include:

- a) Vehicle detection;
- b) Electronic Speed Limit Signs (ESLS);
- c) Sign activation and timing mechanisms;
- d) Logging of activations and all device failures;
- e) Solar/mains power system;
- f) Communication equipment (typically a wireless modem for STREAMS communication);
- g) Associated Static Signage.

3.1.2 The locations of side road detectors and Electronic Speed Limit Signs (ESLS) shall be determined by referencing Technical Alert Document – “Distances of ESLS and Side Road Detection for Side Road Activated Speeds SRAS”.

3.1.3 The SRAS system shall typically operate as an autonomous system.

3.1.4 A pair of signs are required on each approach.

3.1.5 Each ESLS shall operate as a slave to the SRAS system.

3.1.6 Monitoring of the SRAS system shall be via STREAMS. See Appendix B.

3.1.7 In addition to STREAMS, all system functionality shall be accessible via web interface using a standard browser.

3.1.8 In the event where all detectors fail for any one approach the signs shall default to the reduced speed limit as specified in the tender documents (typically 70 km/h or 80 km/h).

3.1.9 In the event of a major sign failure the sign shall default to a blank display as specified in AS 5156 Clause 3.7.

3.2 CONTROL MONITORING SYSTEM

3.2.1 The SRAS system shall be locally controlled by a type approved controller.

3.2.2 The SRAS controller shall constitute the interface between the ESLS signs and the detectors.

3.2.3 Unless otherwise specified in individual tender documents, communications between the field controller and each sign or detector shall be via licence free wireless communication.

3.2.4 Unless otherwise specified in individual tender documents, communications between STREAMS and each site shall be via a 3G/4G modem.

3.2.5 The SRAS controller shall support a minimum of 16 detector inputs which can be configured to activate/deactivate ESLS as required.

3.2.6 Where divided roads or those with turning lanes require additional vehicle detection, the system shall support additional inputs/outputs, configuration, extension timers, monitoring and logging for the additional detectors.

- 3.2.7 The firmware/software in the system controller shall be upgradeable so that additional functionality can be added. This functionality may include, for example, alterations to the software interface, additional logging, updated protocols or support for additional protocols.

3.3 SYSTEM CONFIGURATION

- 3.3.1 System functionality shall be configurable locally using a standard browser.
- 3.3.2 All activation periods and delays shall be configurable via this interface in 0.5 second intervals or less.
- 3.3.3 The following are the minimum intervals for configuration:

Parameter	Description	Range	Interval
Activation delay	Delay between vehicle detection and sign activation.	0 to 10 seconds	0.5 seconds
'On' time	Minimum ESLS activation period, this is extended for each subsequent detection or while the vehicle is present at a stop line.	0 to 60 seconds	0.5 seconds
Delay 'off'	Delay between vehicle no longer being detected and sign deactivation.	0 to 10 seconds	0.5 seconds

Table 3-1 - System Configuration Parameters

- 3.3.4 In addition to the intervals above, it shall be possible to configure any of the inputs to either activate or deactivate the ESLS on a particular (or all) approach(es).

3.4 MONITORING

- 3.4.1 It shall be possible to monitor the live status and activation of the SRAS system via a web interface using a standard browser.
- 3.4.2 The system shall be designed for monitoring through the DoT ITS Platform. See Appendix A for an overview of the STREAMS platform.
- 3.4.3 Systems connected to STREAMS shall operate according to the details in Appendix B3.
- 3.4.4 Systems designed to operate on STREAMS shall be compatible and shall obtain and supply evidence prior to supply. See Appendix D, Requirements for Type Approval.
- 3.4.5 The system shall provide status information to the monitoring system for all devices as specified in Appendix C1.
- 3.4.6 It shall be possible to monitor the live status and activation of the SRAS system via a web interface using a standard browser.

3.5 LOGGING

- 3.5.1 The system shall provide internal fault logging for all device failures, as specified in Appendix C3, with a minimum history of 5000 entries.
- 3.5.2 Additionally, it shall provide logging of detections and activations in accordance with Appendix C.
- 3.5.3 The control module shall store all the historical logs as previously described. If the storage memory is full, the control module shall delete the oldest records to make space for the new records as required.
- 3.5.4 This log shall be capable of download via STREAMS using the protocols in Appendix B.
- 3.5.5 Additionally, the log shall be capable of download via a web browser either through a local or secure remote connection. The retrieval/download of the logs is to be in a common interchange format, for example CSV or similar.
- 3.5.6 The SRAS control module shall provide an Ethernet interface whereby a laptop or a modem can be connected to allow a user to access to the system status and logs.
- 3.5.7 Access to the device configuration, status and logs shall be secured with usernames and passwords.

3.6 SYNCHRONISATION

- 3.6.1 Every ESLS within a single speed zone or treatment shall be synchronised to ensure all signs within a single treatment display the same speed at all times. This is particularly important where two adjacent signs are facing the same approach.
- 3.6.2 An error of more than a second shall be considered a major system failure and result in a blank display.
- 3.6.3 The internal time clock shall maintain accuracy to within 1 second per day. The time synchronisation shall set the slave's local time no less than twice per day via GNSS (GPS).

3.7 FACILITY SWITCH FUNCTION

- 3.7.1 Each sign and SRAS controller shall incorporate an internal facility switch function or manual override function (manual switch and/or software switch), accessible from the inside of the housing, for testing and maintenance purposes.
- 3.7.2 The switch shall include the following positions:

Switch Position	Function
Auto	This position shall allow the system to operate normally
Off	This position shall switch the signs off
On	This position shall switch on the reduced speed

Table 3-2 - Facility Switch Positions

SECTION 4 MECHANICAL REQUIREMENTS

4.1 GENERAL

- 4.1.1 ESLS shall conform to the requirements of DoT TCS 037 “Specification for the Supply of Electronic Speed Limit Signs”
- 4.1.2 Where Inductive Detector Loops are used, these vehicle detectors are to be installed in accordance with Section 733, TC-2032 and TC-1320 and TCS 054.
- 4.1.3 Where alternative vehicle detectors are proposed, they are to be installed in accordance with manufacturer guidelines and the agreement of DoT Intelligent Transport Systems group.

4.2 CABINETS FOR SRAS CONTROLLER UNIT

- 4.2.1 For solar powered systems the control system, battery and all associated equipment shall comply with the requirements of AS 4086.1, AS 4086.2, AS/NZS 4509.2 and be housed in one of the following:
 - 1. Approved Intelligent Transport Systems cabinet (preferred); or
 - 2. Approved universal roadside cabinet.
- 4.2.2 The cabinet shall be locked using three standard DoT traffic signal controller locks.
- 4.2.3 Where relevant, the foundation for the control equipment cabinet shall comply with DoT Standard Drawing TC-1203.

4.3 SIGN MOUNTING

- 4.3.1 Unless otherwise specified, each sign shall be mounted directly onto a 2B traffic signal pedestal and shall be secured from the rear of the sign enclosure as specified in TCS 037.
- 4.3.2 Access for all power supply, control and communication cabling shall be through the centre of the pedestal and shall enter the sign housing through appropriately constructed, sealed entry holes.

4.4 SOLAR PANEL MOUNTING

- 4.4.1 Where solar power is specified, the contractor shall ensure that the design of the support post is suitable for carrying the load associated with the sign, including battery, and solar panel. The design should include but not limited to the foundation and pole.
- 4.4.2 The proposed support post shall be proof engineered by a DoT approved consultant.
- 4.4.3 Where solar power is specified, 2B traffic signal pedestal shall not be used.
- 4.4.4 Posts shall be hot-dip galvanized in accordance with the relevant requirements of AS/NZS 4680.
- 4.4.5 The solar panels shall be installed in a position that minimises the possibility of vandalism and theft. The lowest part of the solar panels should be at least 4m above ground level.
- 4.4.6 The solar panel shall be designed for ease of cleaning and equipped with deterrents to bird roosting.

SECTION 5 ENVIRONMENTAL REQUIREMENTS

5.1 GENERAL

- 5.1.1 ESLS shall conform to the requirements of TCS 037 “Specification for the Supply of Electronic Speed Limit Signs”

5.2 ENCLOSURE PROTECTION

- 5.2.1 All control system and battery housings shall meet the enclosure protection requirements for IP45 in accordance with AS 60529 or greater where specified in the relevant Australian Standard or DoT Specification.

5.3 WIND LOADING

- 5.3.1 The facilities provided for supporting and stabilizing/anchoring the sign (and where applicable, solar panels) shall ensure that, when installed for normal operation, the sign will maintain its intended orientation and position when subjected to the wind-loading conditions applicable to the region in which the sign is intended to be used, in accordance with AS/NZS 1170.2.
- 5.3.2 All support posts shall be suitable for carrying the load associated with the system, including any cabinets, batteries, and solar panels.
- 5.3.3 Loading shall include mass of the post and any post mounted appurtenant items, and wind forces for the region as defined in AS/NZS 1170.2.

5.4 TEMPERATURE AND HUMIDITY

5.4.1 The system and associated equipment shall be designed to operate under any conditions of the following conditions:

- a) Ambient air temperatures within the range -15°C to 50°C ; and
- b) Insolation of up to $1000\text{W}/\text{m}^2$, incident at an angle of 30° from the vertical, applied to the maximum exposed surface of the equipment

For equipment within enclosures, this may be achieved by:

- c) Double-skin construction of the enclosure with appropriate ventilation; or
- d) Ensuring that all components within the enclosure are temperature rated to at least 60°C ;
or
- e) Both of the above measures.

5.4.2 Consideration shall be given to protection against the effects of high humidity, including condensation following a drop in ambient temperature.

SECTION 6 ELECTRICAL REQUIREMENTS

6.1 GENERAL

- 6.1.1 The sign displays, associated detectors, monitoring and the control and communications equipment shall operate at extra low voltage (ELV).
- 6.1.2 All equipment shall be internally protected against damage resulting from:
- lightning strikes at or near the sign;
 - electrical transients on power cabling;
 - electrical transients on communications wiring;
 - radio frequency interference;
 - static electrical discharge.

6.2 SOLAR POWER

- 6.2.1 Where specified in individual tender documents, the system shall be designed for solar powered operation.
- 6.2.2 The solar power system shall be designed, constructed and installed in accordance with AS 4509.2, AS 4086.1 and AS 4086.2 as specified in Clause 4.4 of AS 5156.
- 6.2.3 Where solar power is specified, the contractor shall design a suitable standalone solar power system, which shall be designed by an accredited or suitably qualified designer.
- 6.2.4 When designing the standalone solar power system consideration must be given to the power consumption, the hours of operation, the surrounding environment and the average amount of sunlight available.

6.3 MAINS POWER

- 6.3.1 Where mains power is specified in the individual tender documents, system shall be designed to comply with all applicable requirements of AS/NZS 3000 and AS/NZS 3100.
- 6.3.2 The mains supply voltage shall be deemed to be 230 Vac +10%, -6% in accordance with AS 60038, Section 2. The system and or sub-elements of the system shall be capable of operating satisfactorily from the same within $\pm 15\%$.
- 6.3.3 The Contractor shall install all specified pits and conduits in accordance with DoT Standard Specification Section 733.
- 6.3.4 Unless otherwise specified in individual tender documents, cabinets used for mains powered systems shall conform to the requirements of TCS 043 "Specification for the Supply of Electrical Distribution Cabinets"
- 6.3.5 If a new point of supply is established, a type 2 Distribution Board cabinet, shall be installed. This cabinet is where the point of supply is terminated and where the power meter will be located.

6.4 SRAS CONTROLLER BATTERY BACKUP

- 6.4.1 Mains powered systems shall include battery backup capable of maintaining normal operation for a minimum period of 24 hours.
- 6.4.2 Standalone solar powered systems shall include battery backup capable of maintaining normal operation during periods of minimum solar irradiance for a minimum period of 72 hours.
- 6.4.3 Suitable deep discharge, gel type batteries shall be used in the backup system.
- 6.4.4 The service life of batteries shall be not less than three years.
- 6.4.5 In general, batteries shall comply with AS 4086.1. Additionally, lithium batteries shall comply with AS IEC 62619.
- 6.4.6 The installation of batteries shall comply with AS 4086.2.

6.5 ELECTROMAGNETIC COMPLIANCE (EMC)

- 6.5.1 All devices supplied under this specification shall comply with:
- AS/NZS 61000.6.1 for immunity; and
 - AS/NZS 61000.6.3 for emissions.
- 6.5.2 Devices shall also comply with the relevant requirements of the Australian Communications and Media Authority (ACMA) and shall be labelled with a RCM label as shown in Figure 6.1



Figure 6.1 - RCM Compliance Label

SECTION 7 MARKINGS AND DOCUMENTATION

7.1 GENERAL

- 7.1.1 All SRAS cabinets shall be marked with an appropriate standard cabinet label in accordance with DoT standard drawing number TC 2100 displaying associated site numbers.
- 7.1.2 The cabinet shall carry readily accessible identification markings (by securely affixed plate or other approved means) which shall include the following information:
- a) Description identifying the unit;
 - b) the name, trade name or trademark of the manufacturer;
 - c) the equipment code or model number;
 - d) batch code, serial number, or other marking to provide traceability under the manufacturer's quality management system;
 - e) the rated supply voltage, power and/or current;
 - f) date of manufacture;
- 7.1.3 In addition to the markings and labels identified in Clause 7.1.2, each individual module within the system shall be legibly and durably marked with:
- a) the name, trade name or trademark of the manufacturer;
 - b) the equipment code or model number;
 - c) batch code, serial number, or other marking to provide traceability under the manufacturer's quality management system;
 - d) the rated supply voltage, power and/or current;
 - e) date of manufacture;
 - f) the type approval number of the relevant Certificate of Suitability (if applicable);
 - g) RCM certification (as applicable);

7.2 ELECTRONIC SPEED LIMIT SIGNS (ESLS)

- 7.2.1 Each ESLS shall be marked, in a prominent position, with the required information specified in TCS 037 and AS 5156.
- 7.2.2 In addition to this, each ESLS shall be legibly and durably marked, in a prominent position on the outside, with a label identifying the SRAS controller and site of which it is a member.

SECTION 8 INSTALLATION AND COMMISSIONING

8.1 GENERAL

8.1.1 The SRAS system shall be installed in accordance with:

- a) All the manufacturer's instructions.
- b) The requirements of this specification.
- c) Contract Standard Section 732.
- d) The requirements of individual contract documents.

8.1.2 All pits and conduits shall be installed in accordance with Contract Standard Section 733.

8.1.3 When locating the signs, controller, detectors and other related equipment consideration must be given to the following:

- a) Sign, controller & detectors location;
- b) Sign visibility;
- c) Protection of sign (e.g. guard rail);
- d) Access to the sign for maintenance activities;
- e) Existing static signage.

8.1.4 Signs should be aligned to ensure the maximum visibility to approaching drivers.

8.1.5 The preference should be given to out-of-pavement vehicle detectors, where this is possible.

8.1.6 In-pavement loops shall not be installed on spray sealed road surface.

8.1.7 As-built drawings, detailing sign locations, detectors, pits and conduits, shall be provided once the works are complete.

APPENDIX A DOT ITS PLATFORM

(Informative)

A1 GENERAL

- A1.1 DoT ITS platform currently uses the STREAMS system.
- A1.2 STREAMS is owned and maintained by Transmax Pty Ltd, a Queensland based company which is part of Queensland Main Roads.
- A1.3 STREAMS is an integrated control system which is being used by DoT to operate its ITS Freeway Management Devices on Melbourne's freeway network.
- A1.4 All ITS field devices must be compatible with STREAMS.
- A1.5 Typical ITS field devices connected to and operated by STREAMS include:
- Variable Message Signs (VMS)
 - Freeway Data Stations (FDS)
 - Ramp metering/control signs (RC)
 - Lane Control Signs (LCS)
 - Lane Use Signs (LUS)
 - Travel Time Signs (TTS)
- A1.6 The above devices are typically connected to STREAMS via a Field Processor (FP).

A2 FIELD PROCESSOR

- A2.1 The FP is used to interface internet protocol (IP) and serially connected field devices to STREAMS.
- A2.2 The FP is either installed within an ITS Field Cabinet or in DoT building at Kew.
- A2.3 The ITS Field Cabinet is typically located adjacent to the freeway/highway.

A3 COMPLIANCE WITH STREAMS

- A3.1 SRAS systems shall be compatible with the STREAMS Simple Device Interface function.

APPENDIX B MONITORING AND COMMUNICATIONS

B1 GENERAL

B1.1 A typical SRAS connection schematic is shown in Figure B.1 below.

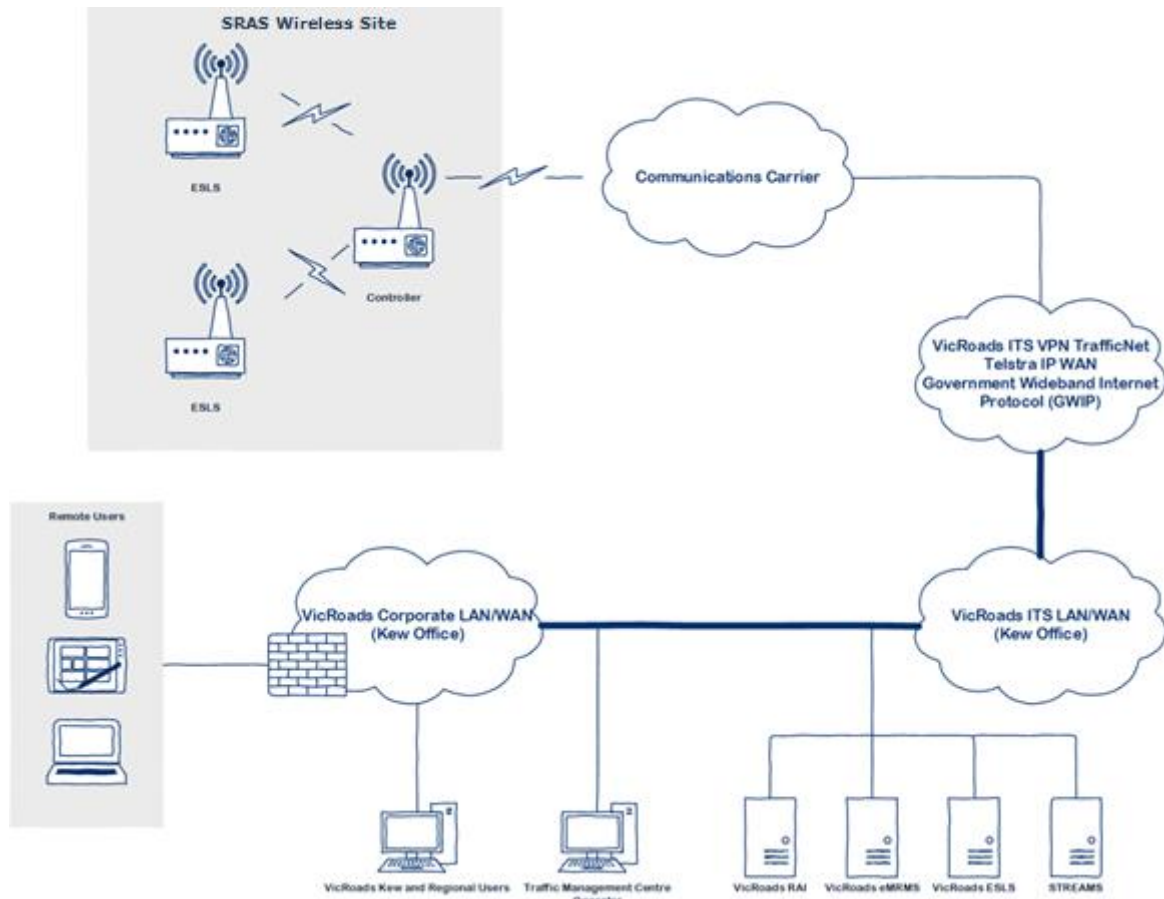
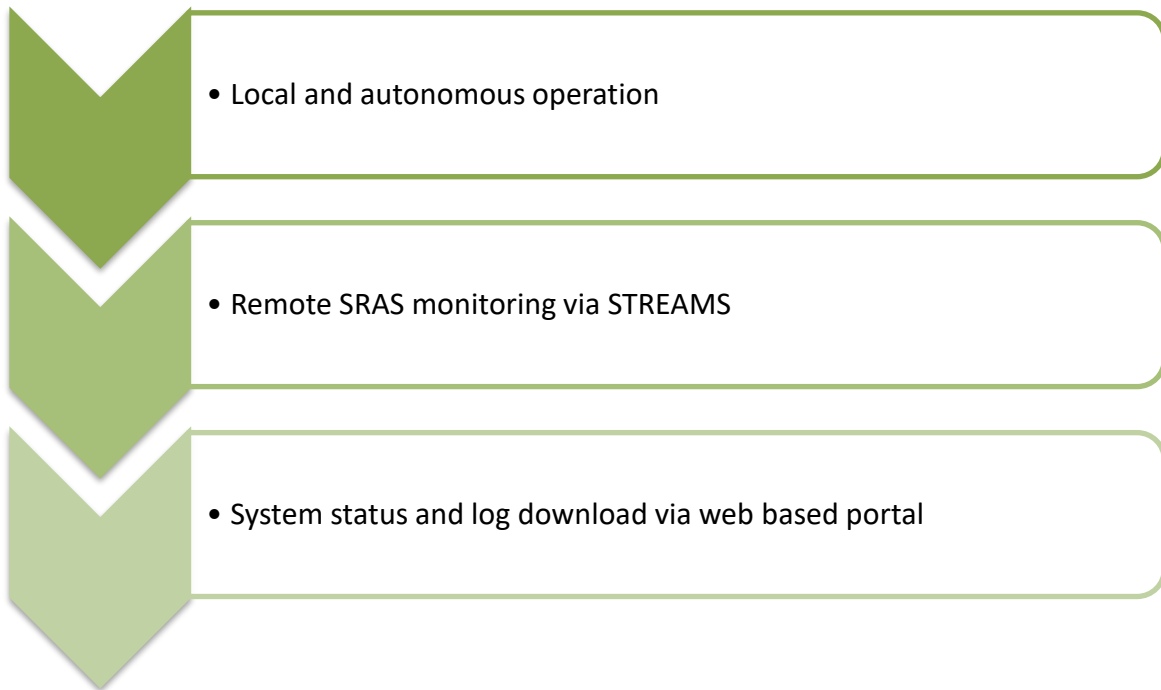


Figure B.1 – Wireless SRAS System

B2 HIERARCHY OF OPERATION

- B2.1 Typically, SRAS systems are controlled locally and autonomously.
- B2.2 This autonomous operation shall be remotely monitored via STREAMS.
- B2.3 SRAS live system status and historical activation and error logs can be remotely accessed via a we based portal.



B3 STREAMS

B3.1 The DoT ITS platform currently uses the STREAMS system to monitor SRAS controllers connected to the DoT communication network. See Figure B.3 below.

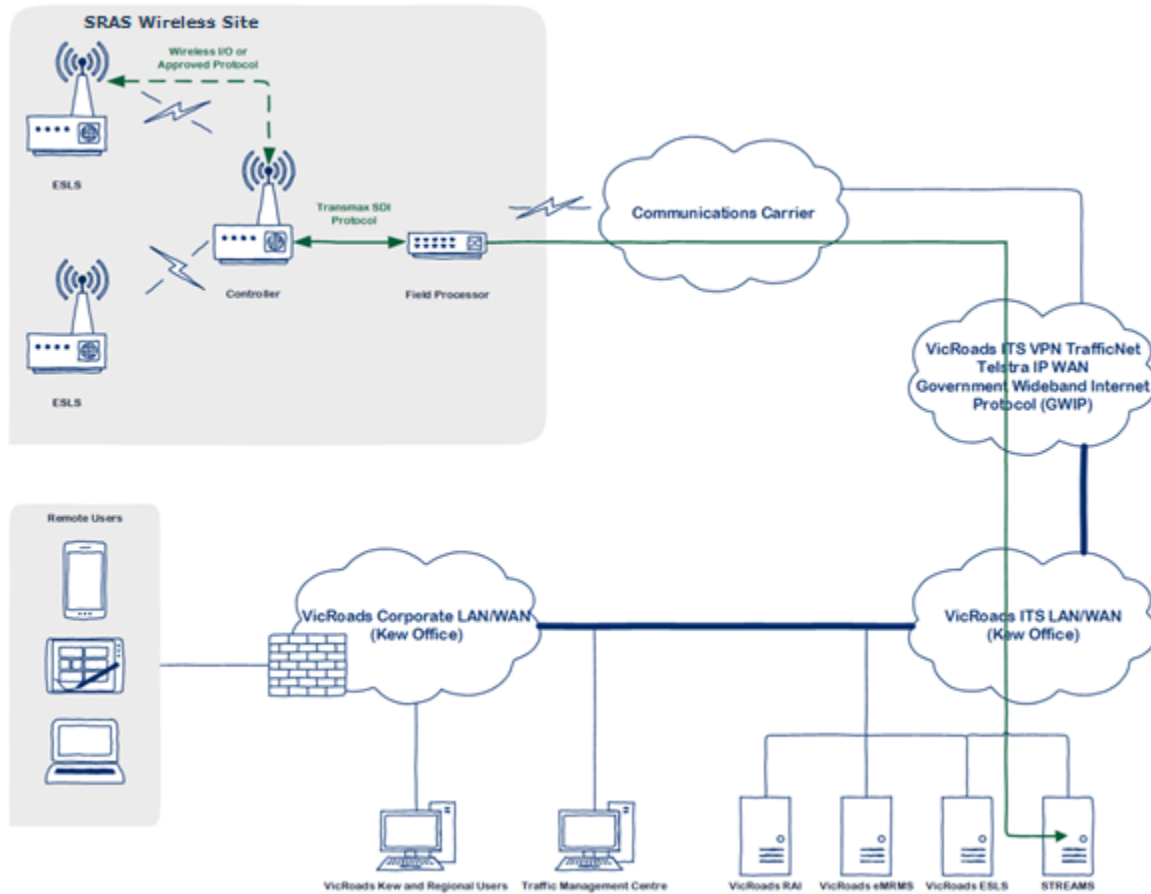


Figure B.3 - STREAMS System

- B3.2 Communications between STREAMS and the SRAS controller shall be via Transmax “Modbus Interface for Simple Devices”.
- B3.3 Details of device monitoring (both the Modbus Server and the connected system), sensor readings, discrete inputs and logging shall be provided by DoT.
- B3.4 Modbus Interface for Simple Devices “Device Technical Guide” and “Device Product Guide” are available from Transmax for additional details.

APPENDIX C FAULT NOTIFICATIONS AND LOGGING

(Normative)

C1 MINIMUM REQUIRED FAULT NOTIFICATIONS (STREAMS)

C1.1 The system shall provide to STREAMS, as a minimum, the alarms detailed in Table C-1 below.

Entry	Description	Fault Classification
Electronic Sign Fault		
Sign power failure	The external power source to the sign has failed	Major
Solar panel tilt tamper (ESLS)	The solar panel has been moved.	Major
Sign Faulty (ESLS)	Sign has failed and/or sign has blanked	Major
ESLS door	The ESLS door is open	Major
Facility Switch override	Facility Switch is not in AUTO position	Major
SRAS Controller Faults *		
Mains/Solar supply Failure	The external power source to the controller has failed.	Major
Battery Level Warning	The battery has 24 hours of charge left.	Minor
Battery Failure	The battery has failed.	Major
Solar panel tilt tamper	The solar panel has been moved.	Major
Cabinet door	The controller cabinet door is open	Major
Processor or System Failure	The controller processor or system has failed.	Major
Communication failure - ESLS	The ESLS has stopped communicating with the SRAS controller.	Major
Communication Failure – Alternative Detector	The alternative detector has stopped communicating with the SRAS controller.	Major
Communication failure (polling fail) – SRAS Controller	Controller stopped responding to STREAMS polling.	Major
Vehicle Detection Faults **		
Detector Faulty	Loop/detector card has failed	Major
Alternative detector fault	Detector failed	Major

* - SRAS Controller must report each ESLS related fault associated with corresponding sign ID

** - SRAS Controller must report each detector related fault (loop or alternative) in association with the corresponding detector number

Table C-1 - Minimum required fault notifications

C2 MINIMUM REQUIRED FAULT NOTIFICATIONS (FUTURE ESLS PLATFORM)

C2.1 The system shall be capable of providing the fault notifications, as a minimum, as the alarms detailed in TCS 037.

C3 MINIMUM LOGGING REQUIREMENTS (SRAS)

C3.1 The system shall store, as a minimum, the log entries detailed in Table C-2 below.

Entry	Description	Log Category
Electronic Sign Logs		
Sign power failure	The external power source to the sign has failed	Fault - Major
Solar panel tilt tamper (ESLS)	The solar panel has been moved.	Fault - Major
Sign Faulty (ESLS)	Sign has failed and/or sign has blanked	Fault - Major
ESLS door	The ESLS door is open	Fault - Major
Facility Switch override	Facility Switch is not in AUTO position	Fault - Major
Sign activation***	Activation duration for electronic sign	Sign status
SRAS Controller Logs *		
Mains/Solar supply Failure	The external power source to the controller has failed.	Fault - Major
Battery Level Warning	The battery has 24 hours of charge left.	Fault - Major
Battery Failure	The battery has failed.	Fault - Major
Solar Panel Failure	The solar panel has stopped operating.	Fault - Major
Solar panel tilt tamper	The solar panel has been moved.	Fault - Major
Cabinet door	The controller cabinet door is open	Fault - Major
Processor Watchdog	The controller processor has flagged a watchdog alarm.	Fault - Major
Processor or System Failure	The controller processor or system has failed.	Fault - Major
Controller facility Switch override-speed change	Facility Switch has been set to manual-speed change	Fault - Major
Facility Switch override-signs turned off	Facility Switch has been set to manual-sign turned off	Fault - Major
Communication failure -ESLS	The ESLS has stopped communicating with the SRAS controller.	Fault - Major
Communication Failure – Alternative Detector	The alternative detector has stopped communicating with the SRAS controller.	Fault - Major
Vehicle Detection Logs **		
Loop/Detector Card Faulty	Loop/detector card has failed	Fault - Major
Alternative detector faulty	Detector failed	Fault - Major
Detector activated ***	Activation duration of vehicle detector	Detector Status

* - SRAS Controller shall log each ESLS related fault associated with corresponding sign ID

** - SRAS Controller shall log each detector related fault (loop or alternative) in association with the corresponding detector number

*** - SRAS Controller shall upload log entry into STREAMS once an hour, on the hour, each entry shall be associated with corresponding sign ID, GPS timestamp and detector number

Table C-2 - Minimum logging requirements

C4 MINIMUM LOGGING REQUIREMENTS (ESLS)

C4.1 The ESLS shall store, as a minimum, the log entries detailed TCS 037.

APPENDIX D REQUIREMENTS FOR TYPE APPROVAL

(Normative)

D1 GENERAL

- D1.1 Electronic Speed Limit signs for use on DoT projects are required to hold current DoT Type Approval.
- D1.2 The Product Compliance evaluation process shall be carried out in accordance with DoT Guideline TCG 016.
- D1.3 To enable assessment for the purpose of granting Type Approval, the manufacturer/supplier is to submit a formal request for Type Approval, for each sign type submitted, accompanied by the following:
- A complete working sample of the sign.
 - An outline drawing showing the general presentation and overall dimensions of the complete sign.
 - Documentation to demonstrate that the sign has been manufactured and supplied under an approved quality assurance system.
 - Documentation to demonstrate that the sign conforms to the requirements of DoT Specification. This may be by means of submitting test results from approved and appropriately qualified independent testing organisations, or providing the manufacturer's assurance that the product complies with each paragraph of the specification, as appropriate.

D2 REQUIRED NATA ACCREDITED TESTING

- D2.1 Notwithstanding G1, the manufacturer/supplier shall submit test results from a NATA accredited testing organisation to demonstrate compliance with the following:

Requirements	Evidence
Temperature and humidity	Test Report
Enclosure protection	Test Report
EMC Compliance	Test Report

NOTE: Temperature and humidity test - The equipment, while in operation, shall withstand continuously for 72 hours at an ambient temperature of 50°C, and with 90% relative humidity, and with 1 kW/m² insolation applied to the maximum exposed surface, without any adverse effect to its operation. Where it is not practical to provide the required insolation during testing, it is acceptable to increase the upper ambient temperature limit by 10°C as substitute.

- D2.2 The supplier shall provide evidence of compatibility for the specified control system.

D3 COMPATIBILITY WITH TRANSMAX SDI PROTOCOL

- D3.1 Where applicable, the supplier shall provide evidence of compatibility with Transmax SDI Protocol.

D4 COMPATIBILITY WITH STREAMS

D4.1 Where applicable, the supplier shall provide evidence of compatibility with STREAMS.

D5 OTHER REQUIRED INFORMATION

D5.1 Confirmation that the manufacturer is on the DoT Register for the Pre-qualification for Supply of On-Road Electronic Devices (SOED).

D5.2 Copy of LED manufacturer's specification for each LED type used.

D6 ASSESSMENT PROCEDURE

D6.1 The assessment procedure for an ESLS may include, but not limited to, the following:

- a) Assessment of construction, workmanship and critical dimensions;
- b) Preliminary assessment of the sign under continuous burning at the DoT Test Rack for a period of not less than three months; and
- c) Evaluation of the submitted data against the requirements of the specification.

D6.2 Where some of these procedures have been completed prior to formal submission, the results will be considered in the evaluation, provided there is no relevant change in the design of the sign.

D6.3 The supplier is to state whether tests carried out prior to formal submission were carried out on an identical sample of the sign.

D6.4 DoT may require a trial installation of the sign to be undertaken.

D7 TYPE APPROVAL

D7.1 The decision to grant a Certificate of Type Approval is at the sole discretion of DoT.

D7.2 DoT may require additional information or testing to be carried out as part of its evaluation of the product.

D7.3 If the product is approved, a Certificate of Type Approval will be provided to the supplier. Until such time as this Certificate is issued, the product is not to be used for DoT works.

D7.4 The manufacturer shall advise DoT in writing of any changes in hardware or firmware in relation to the Type Approved product, DoT reserves the right to review and approve/reject the design changes at DoT discretion.



APPENDIX E DETAILS TO BE INCLUDED WHEN TENDERING

(Informative)

E1 GENERAL

E1.1 Installation requirements will be site specific and detailed in individual tender documents.

E1.2 The following details should be considered when preparing tender documents:

- a) The size of the proposed signs, i.e. B or C size (with respect to TCS 037 and AS 1743);
- b) Whether the proposed signs are mains or solar powered;
- c) Additional requirements for battery backup;
- d) The numbers of signs and speed values to be provided;
- e) The mounting arrangements for the signs;
- f) Traffic counts should be provided for solar calculation purposes.