Appendix – C and D

Transport and Main Roads Specifications

MRTS214 Provision of Wireless Traffic Sensors (WTS)

March 2020

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Appendix C – Commissioning Report for Traffic Monitoring Device Installation

Activity performed: (CIRCLE ITEMS AS APPLICABLE)

Items marked with asterisk (\*) must be completed

\* Installation / Replacement / Remove of following device type:

\* Bluetooth Detector / Vehicle Classifier / Cycle Counter / VAS / Other – specify:

**Device and Site Details**

|  |  |  |  |
| --- | --- | --- | --- |
| Client Details: | | | |
| \* TMR Region Name: | | \* TMR Region Operation Contact: | |
| \* TMR Project Manager Name: | | \* Project Manager Contact No: | |
| \* Installer Name: | | Verifier Name: | |
|  | | | |
| **Site Details:** | | | |
| **\* Install & Test Date**: | | | |
| **\* Cabinet Name and Number:** | | | |
| **\* Site / Location Description:** | | | |
| **\* GPS Coordinates:** | ***North:*** | | ***East:*** |
|  | | | |
| **Device Details:** | | | |
| **\* Device Make & Model:** | | **\* Device Serial No:** | |
| **\* IP Address set:** | | **\* Subnet Mask set:** | |
| **IP of Local gateway set in device:** | | **Local NTU/Switch Port No (if applic):** | |
| **\* TELEMETRY SERVICE AT SITE (circle as applicable)** | | | |
| **IPRT Ethernet | IPRT wireless simcard | TSNET simcard | Other (specify)** | | | |
|  | |  | |
| **Complete the following for Sites with TSNET Wireless Comms** | | | |
| **\* Modem Make & Model:** | | | |
| **\* Modem Serial No:** | | **\* Modem IMEI:** | |
| **\* Simcard ID:** | | **\* Simcard phone number:** | |
| **Simcard PIN:** | | **Simcard PUK:** | |
| **TSNET Username assigned:** | |  | |
| **Telstra Mobile Plan:** | |  | |
| **Electrical Acceptance Test – COMPLETE**  **PRIOR TO POWERING DEVICE** | | **PASS / FAIL** | **Remarks** |
| Device IP Address verified as available from local laptop ping request | | PASS / FAIL |  |
| All ELV & LV Cables Firmly Secured at Lugs and in Screw Terminals | | PASS / FAIL |  |
| Earth Continuity of Top Hat Section and (by Strap) to Top Hat Door | | PASS / FAIL |  |
| LV Supply Voltage @ Power Supply Input Terminals | | VAC |  |
| ELV Supply Voltage @ Power Supply Output Terminals | | VDC |  |
| Installation Safety Verification Test Certificate Received | | PASS / FAIL | Per Qld Electrical  Safety Act 2002 |
|  | |  |  |
| **Installation Acceptance Test** | | **PASS / FAIL** | **Remarks** |
| All applicable device information listed on Page 1 e.g. serial numbers, make & model, IMEI have been recorded | | PASS / FAIL |  |
| Network settings verified (Correct IP address, Subnet, Gateway) | | PASS / FAIL |  |
| GPS Data recorded in correct format | | PASS / FAIL |  |
| Cabinet & Surrounds are Clean, Free of Off Cuts (Contractor Supplied Materials) | | PASS / FAIL |  |
| All Cabinet Cabling Sleeve Labelling Fitted Per ITS Sketch | | PASS / FAIL |  |
| Device OEM power, Ethernet and Antenna cables connected | | PASS / FAIL |  |
| Pre-terminated “Straight Through” CAT5E T568A (or T568B) | |  | Length       m |
| Device connected to NTU | | PASS / FAIL |  |
| Device verified as visible on the ITS Network (Ping Test) | | PASS / FAIL | By network verifier |

*\_\_\_\_\_*     *\_\_\_\_\_\_,* I certify that I have completed the installation in accordance with all relevant safety standards, TMR procedures, manuals and documents supplied to me by the Project Manager (listed on page 1), and the device is operating correctly.

|  |  |
| --- | --- |
| **Installer Signature** | **Date** |
|  |  |

Appendix D – MRTS214 – Provision of Wireless Traffic Sensor (WTS) – Evaluation Checklist

| MRTS214 – Provision of Wireless Traffic Sensor (WTS) | **Reference clause** | **VERIFICATION METHOD** | | | | | **Supplier's Statement of**  **Compliance / Comments** | **ITS Compliance** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Visual inspection** | **NATA approved certificate (or  equivalent)** | **Field/bench test** | **Detailed drawings** | **Manufacturer conducted tests records / other documents** |
| **Quality System Requirements** | | | | | | | | | |
| Detailed designs of the WTS layout, fabrication and assembly drawings, calculations, specifications and certifications of the WTS components (signed by the Contractor’s RPEQ) shall be submitted to the Principal via the Administrator for verification of compliance to this specification.   1. Detailed block diagram showing the link between main functional blocks and interfaces. 2. Fabrication drawings. | 4.2 |  |  |  |  |  |  |  |
| All radio communications shall comply with the relevant regulatory requirements of ACMA as well as the immunity and emissions requirements in AS/NZS 61000.6.1 and AS/NZS 61000.6.3 respectively.   1. RCM compliance confirming the WTS radiofrequency performance requirements. | 4.2 |  |  |  |  |  |  |  |
| As specified in MRTS201, a sample WTS shall be provided. The sample WTS shall be complete with all components intended to be used in the WTS to be provided. | 4.2 |  |  |  |  |  |  |  |
| The contractor installing the WTS shall warrant all work performed and all materials supplied for the installation against defects for a minimum of three (3) years in accordance with the warranty requirements of MRTS201.   1. Warranty certificate | 4.3 |  |  |  |  |  |  |  |
| **Functional Requirements** | | | | | | | | | |
| The WTS shall as a minimum consist of:   * MAC-address Detector (with receive antenna) * WTS Field Processor (WTS-FP) capable of connecting to TMR’s ITS network as well as any IP based network using IPv4. IPv6 support is desirable. * Beacon (Transmit antenna) * Data storage device * Power supply; and * Network and communications interface (see 5.1.1 and 5.1.5). | 5.1 |  |  |  |  |  |  |  |
| The WTS components shall be physically connected in a compact arrangement such that they can be collocated in the same enclosure. In addition, to minimise the use of separate antennas, the WTS RF interface shall support all frequency bands used by the device and shown in Table 5-1. This can be done using a single multiband antenna. | 5.1 |  |  |  |  |  |  |  |
| The antenna used on the WTS shall be independently assessed and approved by the Principal. | 5.1 |  |  |  |  |  |  |  |
| The MAC address detection of the WTS shall be capable of capturing MAC addresses from the target vehicular and pedestrian environments using different modes including, classic Bluetooth, BLE, LAP and Wi-Fi. | 5.1.1 |  |  |  |  |  |  |  |
| The WTS shall have provision to be used as a beacon to transmit ITS messages to the relevant vehicular and pedestrian environments. | 5.1.1 |  |  |  |  |  |  |  |
| After receiving ITS messages from the head-end, the WTS beacon shall continue to broadcast the ITS messages to the vehicular/pedestrian environment and only cease broadcasting when a negating message is sent from the head-end, or a pre-defined broadcast duration is reached, whichever occurs first. The range of transmission of the WTS device is generally about 150m. However, the maximum range depends on the signal strength, environmental conditions or interference from other signals. AddInsight® is currently the head-end application intended to broadcast ITS messages. | 5.1.1 |  |  |  |  |  |  |  |
| The WTS FP shall receive MAC address data, and transmit the data in a format compatible with the current version of AddInsight® | 5.1.2 |  |  |  |  |  |  |  |
| The WTS shall also support UI format in MRTS214.  The FP shall have provisions to support custom data formats prescribed by the Principal. |  |  |  |  |  |  |  |  |
| To enable communication with the vehicular and pedestrian environment as well as the Principles Telecommunications Network (PTN), the WTS shall as a minimum provide interfaces as shown in Table 5-1. | 5.1.5 |  |  |  |  |  |  |  |
| Preferred connectors for the RF interfaces (antenna ports) include SMA and SMA-RP. For wired connection to the PTN, RJ45 connectors are preferred. For local access the WTS shall provide a USB port or RS232 access. All connectors shall be secured such that they are firmly in place and resistant to extreme shock and vibration. | 5.1.5 |  |  |  |  |  |  |  |
| The WTS shall implement the NTP protocol and be synchronised to an NTP server prescribed by the Principal. NTP is required for the log file to be downloaded as described in section 6.2. | 5.2 |  |  |  |  |  |  |  |
| **Operational Requirements** | | | | | | | | | |
| The WTS shall be capable of communicating via the TMR ITS network either wirelessly using 3G/4G or via ethernet. All communications with the TMR ITS network shall be in accordance with MRTS245. | 6.1 |  |  |  |  |  |  |  |
| Where the WTS uses an in-built modem, it shall comply with the requirements of TMR's local telecommunications provider. | 6.1 |  |  |  |  |  |  |  |
| The WTS shall be capable of interfacing with a message-oriented middleware selected by the Principal as well as AddInsight®. The contractor shall contact the Principal to determine the current mechanism for interfacing to the field devices. | 6.1 |  |  |  |  |  |  |  |
| The WTS shall support the middleware Kafka for interfacing with Addinsight and other applications | 6.1 |  |  |  |  |  |  |  |
| The WTS shall make provision for the download of data stored in the WTS storage (TMR download service will extract data from the WTS on a daily basis ). | 6.1 |  |  |  |  |  |  |  |
| Data logging shall commence as soon as the WTS has powered-up and initialised and continue as long as the WTS in turned on. The WTS shall be synchronised with the NTP server within 30 seconds after turned on. | 6.2 |  |  |  |  |  |  |  |
| The WTS shall log MAC-addresses as described in the UI format (see Appendix A). The WTS shall also provide data compatible with the current AddInsight® version at the time of purchase. | 6.2 |  |  |  |  |  |  |  |
| The WTS shall be capable of individually enabling/disabling the logging of the following data:   1. Classic BT 2. BLE 3. LAP and 4. Wi-Fi | 6.2 |  |  |  |  |  |  |  |
| The logged MAC address records shall be transmitted from the WTS to the head-end system in batches. The batch size shall be a configurable parameter. The rate of transmitting logged data from the WTS in batches to the head-end system shall be a configurable parameter ranging from hourly to daily. Currently the TMR download service downloads data daily. A more frequent rate may be required in the future. | 6.2 |  |  |  |  |  |  |  |
| WTS MAC address data logging must not interfere with the sending and receipt of log messages and configuration messages to and from the head-end system. | 6.2 |  |  |  |  |  |  |  |
| The WTS shall locally retain a store of logged data of up to 2 million collected MAC address records on a circular buffer, while also uploading data to the back-end system via the Principals Telecommunications Network. The retained data shall be in accordance with the QTDF format and shall persist over power cycles. This feature will also act as a back-up in the event of loss of communications with the Principal's back-end system. When communication is restored, the WTS shall commence transmitting data logs to the Principal's back-end system at the set transmission rate. | 6.3 |  |  |  |  |  |  |  |
| The WTS vendor shall provide a management facility for local and remote control and configuration of the WTS and shall support access via web interface, Command Line Interface (CLI), and centralised management platform access that could be hosted within the Principal's network environment. | 6.4 |  |  |  |  |  |  |  |
| The management system shall implement multiple levels of user access. | 6.4 |  |  |  |  |  |  |  |
| The Management System will support centralised configuration management, archival of device configurations, administration and monitoring of the field deployed Processors. | 6.4 |  |  |  |  |  |  |  |
| The Management system shall provide two options for registering the location of the WTS device, namely, entered manually or automatically based on GNSS connectivity. | 6.4 |  |  |  |  |  |  |  |
| Firmware updates might be done via the field processor directly via the communications interface. | 6.4 |  |  |  |  |  |  |  |
| The WTS Management System shall have sufficient capacity to support the configuration and monitoring of up to 2,000 field deployed WTS units. | 6.4 |  |  |  |  |  |  |  |
| The WTS shall support remote voltage-monitoring capability | 6.4 |  |  |  |  |  |  |  |
| The monitored data will be accessed locally via a Command Line Interface (CLI). Remote monitoring capability shall be provided via SNMPv2 (or better), and/or Modbus protocols in a secure manner. Also, critical events notifications (e.g. significant power deviations, high temperature) shall trigger alerts using SNMP trap protocols. | 6.4 |  |  |  |  |  |  |  |
| The WTS shall support a Dying Gasp function for remote power failure detection (via SNMP traps or equivalent). Other event notifications to be alerted using SNMP trap protocols shall include:   * Significant voltage or power deviations * High temperature. | 6.4.1 |  |  |  |  |  |  |  |
| The management facility shall support WTS FP monitoring including:   * Session monitoring – used to identify a FP session (Uptime, Downtime) and to detect session exceptions * Platform performance metrics (e.g. CPU, memory) * Platform exception logs. | 6.4.2 |  |  |  |  |  |  |  |
| The WTS shall have internal hardware watchdog to recover from system errors that may result in lockup. | 6.4.3 |  |  |  |  |  |  |  |
| The WTS shall provide a means for entering a low power sleep mode during a pre-configured time schedule such as low traffic periods. | 6.4.4 |  |  |  |  |  |  |  |
| The WTS shall also provide a means for entering a low power sleep mode during a pre-set event such as a drop in supply voltage below a configurable setpoint as would be required in solar/battery applications. Once normal voltage resumes the WTS shall wake-up and resume normal operation. | 6.4.4 |  |  |  |  |  |  |  |
| The WTS Field Processor shall support user authentication for both local and remote access using standard industry recognised secure authentication protocols such as EAP, TACACS, RADIUS,LDAP and so on). | 6.5 |  |  |  |  |  |  |  |
| The WTS Field Processor shall support granular user access levels for different device support functions (e.g. configuration, monitoring, etc.). | 6.5 |  |  |  |  |  |  |  |
| The WTS Field Processor shall be able to record user login and logout session. The logging facility will be supported locally and through the WTS Management System (e.g. via Syslog function). | 6.5 |  |  |  |  |  |  |  |
| The WTS Field Processor shall centrally log any configuration changes performed on the WTS FP for auditing and / or forensic purposes (e.g. via Syslog function). | 6.5 |  |  |  |  |  |  |  |
| The WTS Field Processor shall support network access Filtering capability. | 6.5 |  |  |  |  |  |  |  |
| The following features will be supported:   * Certificate or shared key device authentication (Phase 1) * Local, RADIUS, LDAP based user authentication (Phase2) * Advanced Encryption Standard (AES) 256-bit encryption * The use of Public Key Infrastructure (PKI) X.509 based certificates. | 6.5 |  |  |  |  |  |  |  |
| **Mechanical and Physical Requirements** | | | | | | | | | |
| The WTS shall comply with the product lifecycle requirements specified in MRTS201. In addition, unless otherwise specified, the WTS design life shall be a minimum of 10 years. | 7.1 |  |  |  |  |  |  |  |
| The WTS and associated mounting structures and electronics, shall comply with the environmental requirements of MRTS201 General Equipment Requirements. | 7.2 |  |  |  |  |  |  |  |
| The WTS FP shall be capable of continuous, normal operation where the ambient air temperature is between -10°C and 55°C. | 7.2 |  |  |  |  |  |  |  |
| The WTS FP shall be capable of continuous, normal operation where the enclosure air temperature is between -10°C and 75°C. | 7.2 |  |  |  |  |  |  |  |
| The WTS FP shall be capable of continuous, normal operation where the humidity is between 0 to 95% non-condensing. | 7.2 |  |  |  |  |  |  |  |
| The WTS FP shall support environmental monitoring capability (e.g. for remote temperature and humidity monitoring). | 7.2 |  |  |  |  |  |  |  |
| The location and type of mounting structure to be provided to mount each WTS shall be shown on the design documentation. The mounting structure shall comply with the requirements of MRTS201, MRTS61 and MRTS71. | 7.3 |  |  |  |  |  |  |  |
| The final design documentation shall include details of the final footing design, location of the structure and the reduced levels (RLs) and the Contractor shall not commence fabrication of the footing and support structure until that final design documentation has been accepted by the Administrator. | 7.3 |  |  |  |  |  |  |  |
| All WTS equipment and associated devices shall be installed in a suitable roadside enclosure, being:   * A traffic signal top-hat, or * A ground mounted field cabinet complying with requirements of MRTS226, or * An enclosure complying with the requirements of MRTS201 installed on a mounting structure. | 7.4 |  |  |  |  |  |  |  |
| **Technical Requirements** | | | | | | | | | |
| In order to facilitate fast and accurate timing and synchronisation the WTS shall have a battery backed real time clock. | 8.1 |  |  |  |  |  |  |  |
| In addition to the storage requirements defined in 6.3, the WTS shall have non-volatile memory to store all information required to meet the operational and technical requirements. These include additional storage for firmware updates and system logs. | 8.2 |  |  |  |  |  |  |  |
| The WTS shall have provision for both local and remote maintenance and configuration. | 8.3 |  |  |  |  |  |  |  |
| The Contractor shall provide the Principal with control and diagnostic software required for the WTS and associated equipment. | 8.4 |  |  |  |  |  |  |  |
| All software shall be licensed on behalf of, and in the name of, the Principal. | 8.4 |  |  |  |  |  |  |  |
| The Contractor and Principal shall agree what constitutes critical failures and minor failures. | 8.5 |  |  |  |  |  |  |  |
| In the event of critical failures, the WTS equipment shall:   * Return failures as part of the error log. If the failure is an operational and/or telecommunications failure, the WTS shall continue all background data logging functions for upload back to the PTN when the interface communication link is re-established. * Monitor the failure and automatically recover if possible. * If failure requires a restart, automatically shut down in a safe manner maintaining any stored data and automatically send failure logs once the system is restored. | 8.5 |  |  |  |  |  |  |  |
| The WTS equipment shall provide wireless communication to the vehicular environment with a high probability of transmission success over 150 meters line of sight and under typical traffic conditions. Wireless communication performance including antenna selection shall be subjected to testing and approval by the Principal. | 8.6 |  |  |  |  |  |  |  |
| In addition to collecting MAC addresses for traffic analysis, The WTS shall also be used as a beacon to transmit information to vehicles or VRU's in its vicinity. In this case, the WTS being used as a transmitting device shall meet the relevant ACMA requirements | 8.6 |  |  |  |  |  |  |  |
| **Electrical Requirements** | | | | | | | | | |
| The electrical requirements defined in MRTS201 apply to work provided under this specification. Additional requirements are as described below. | 9.1 |  |  |  |  |  |  |  |
| Electrical wiring shall be in accordance with the requirements of AS/NZS 3000 and AS/CA S009. | 9.1 |  |  |  |  |  |  |  |
| The power consumption of the WTS including associated components shall not exceed 9W. This includes any attached devices that may draw power from the device (e.g. Flash memory card, USB etc.). | 9.1 |  |  |  |  |  |  |  |
| The WTS operating voltage will be 12V DC with an operating voltage range in the interval +9V and +24V DC. The WTS shall be powered by an external power adapter suitable for the operational environment specified in clause 7.2. | 9.1 |  |  |  |  |  |  |  |
| The WTS will support reverse polarity protection | 9.1 |  |  |  |  |  |  |  |
| Options for energising the WTS shall include Main power and stand-alone power. In addition, where required, the WTS shall support Power over Ethernet, PoE or PoE+ (IEEE 802.3af). | 9.1 |  |  |  |  |  |  |  |
| The WTS shall have provision for connection to main power using an external adaptor or PoE. | 9.2 |  |  |  |  |  |  |  |
| WTSs energised from mains power may not require secondary battery back-up. However, in order to facilitate fast and accurate timing and synchronisation upon start up, the WTS shall have a battery backed real time clock. The clock shall be able to be synchronised with the Principal's system clock Time error shall be no more than one second over a period of one week. | 9.2 |  |  |  |  |  |  |  |
| The WTS shall have provision for connection the stand-alone power supplies such as solar power. | 9.3 |  |  |  |  |  |  |  |
| A battery backup system shall be provided with each solar powered WTS. The battery back-up shall have the capacity to maintain normal WTS operation for a period of 168 continuous hours, including any communication services. | 9.3 |  |  |  |  |  |  |  |
| Batteries used in the backup shall be in accordance with MRTS201 and shall be of a deep discharge, low-maintenance type with no liquid electrolytes and shall be automatically charged from an internal system provided within the sign. | 9.3 |  |  |  |  |  |  |  |
| The WTS management system shall have provision for monitoring the solar power system including voltage levels. | 9.3 |  |  |  |  |  |  |  |
| **Telecommunications Requirements** | | | | | | | | | |
| The telecommunications requirements defined in MRTS201 apply to work provided under this specification. In addition, all telecommunication equipment shall comply with the relevant regulatory requirements and standards of Australian Communications and Media Authority (ACMA). | 10 |  |  |  |  |  |  |  |
| **Documentation** | | | | | | | | | |
| The documentation requirements defined in MRTS201 apply to work provided under this specification. | 13 |  |  |  |  |  |  |  |