TRANSPORT FOR NSW (TfNSW)

QA SPECIFICATION M923

MEASUREMENT OF SURFACE FRICTION BY SIDEWAYS-FORCE COEFFICIENT ROUTINE INVESTIGATION MACHINE (SCRIM)

REVISION REGISTER

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Transport for NSW

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VERSION FOR: DATE:

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FOREWORD

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REVISIONS TO PREVIOUS VERSION

This document has been revised from Specification TfNSW R423 Edition 1 Revision 2.

All revisions to the previous version (other than minor editorial and project specific changes) are indicated by a vertical line in the margin as shown here, except when it is a new edition and the text has been extensively rewritten.

PROJECT SPECIFIC CHANGES

Any project specific changes are indicated in the following manner:

(a) Text which is additional to the base document and which is included in the Specification is shown in bold italics e.g. ***Additional Text***.

(b) Text which has been deleted from the base document and which is not included in the Specification is shown struck out e.g. ~~Deleted Text~~.

TfNSW QA SPECIFICATION M923

MEASUREMENT OF SURFACE FRICTION BY SIDEWAYS-FORCE COEFFICIENT ROUTINE INVESTIGATION MACHINE (SCRIM)

1 GENERAL

1.1 INTENT

The automated collection of road pavement data is for monitoring the skid resistance of a network of surfaced roads. The Specification is not intended for site specific investigation where data is reported in 5m intervals.

1.2 SCOPE

The Work to be executed under this Specification consists of collecting data using a Sideways-force Coefficient Routine Investigation Machine (SCRIM) in accordance with Test Method TfNSW T189 to:

(a) measure the force exerted on a standard test wheel in contact with a wet road surface in two wheelpaths;

(b) analyse the data to determine the SCRIM Readings in each wheelpath;

(c) analyse the SCRIM Readings over each Interval of 100 m and provide the processed data in the specified format.

1.3 STRUCTURE OF THE SPECIFICATION

This Specification includes a series of annexures that detail additional requirements.

1.3.1 Project Specific Requirements

The General and Specific requirements for the Works are included in Annexure M923/A.

Survey requirements are detailed in Annexure M923/A. A sample Schedule of Work is provided to the details indicated in Annexure M923/A.

1.3.2 Information Supplied by the Principal

The Principal will supply you with the information summarised in Annexure M923/B.

1.3.3 Measurement and Payment and Resolution of Nonconformities

The method of measurement and payment must comply with Annexure M923/B.

Acceptance of materials and work must be in accordance with Annexure M923/B.

1.3.4 Schedules of HOLD POINTS, WITNESS POINTS and Identified Records

The schedules in Annexure M923/C list the **HOLD POINTS** and **WITNESS POINTS** that must be observed. Refer to Specification TfNSW Q for the definitions of **HOLD POINTS** and **WITNESS POINTS**.

The records listed in Annexure M923/C are **Identified Records** for the purposes of TfNSW Q Annexure Q/E.

1.3.5 Planning Documents

The PROJECT QUALITY PLAN must include each of the documents and requirements listed in Annexure M923/D and must be implemented.

In addition, ensure that the relevant requirements in TfNSW Q are incorporated.

1.3.6 Technical Requirements

Technical requirements are described in Annexure M923/E.

1.3.7 Database Format

Database format is specified in Annexure M923/L.

1.3.8 Referenced Documents

Unless specified otherwise, the applicable issue of a referenced document, other than a TfNSW Specification, is the issue current at the date one week before the closing date for tenders, or where no issue is current at that date, the most recent issue.

Standards, specifications and test methods are referred to in abbreviated form (e.g. AS 2350). For convenience, the full titles are given in Annexure M923/M.

1.4 DEFINITIONS AND ACRONYMS

The following definitions and acronyms apply to this Specification:

Counter Direction	The opposite direction of travel to the "Prescribed" direction (refer to RAMS – Lane Numbering).
GDA94 datum	Geocentric Datum of Australia 1994 datum to be used for the Works.
Inner Wheelpath (IWP)	The wheelpath that is to the right of travelled lane.
Interval	The distance that data must be aggregated and reported in the database.
Invalid	Data that is outside the limits specified by the Principal.
Outer Wheelpath (OWP)	The wheelpath that is to the left of travelled lane.

Prescribed Direction	The direction of travel that TfNSW defines, by convention, as the standard direction for each of its roads (refer to RAMS – Lane Numbering).
Road Occupancy Licence	Allows the proponent to use a specified road space at approved times, provided certain conditions are met. The licence applies to the occupation of the "road space" only and does not imply permission or approval for the actual (physical) works being undertaken.
ROADLOC	The name given to the Linear Referencing System used by the TfNSW (refer to RAMS – Linear Referencing).
SCRIM	The Sideways-force Coefficient Routine Investigation Machine is a self contained machine which provides a routine method of measuring the skid resistance of roads under wet conditions, and is capable of testing both wheelpaths of long lengths of road at a constant speed of 50 km/h. SCRIM was developed by the UK Transport Research Laboratory.
Sideways Force Coefficient (SFC)	The parameter measured by the SCRIM. Generally the test wheel operates at an angle of 20° giving a 34% slip ratio and about 97% maximum friction.
SCRIM Reading (SR)	The individual frictional measurement as recorded by SCRIM for a single sub-section 5 metres long. It is expressed as a positive, unsigned integer (equivalent to the SFC x 100).
Maximum Differential SCRIM Reading	The maximum difference between pairs of corresponding Inner and Outer wheelpath SR in an Interval.
SRA	The aggregated SCRIM Reading reported at 100 m Interval that is based on corrected SR readings and analysed using a 4 point average.
Traffic signal green light runs	Green light corridors on survey routes provided by the TfNSW Transport Management Centre (TMC).
Wheelpath	That portion of the pavement that is subject to passage of and loading from heavy vehicle wheels during trafficking. There are two wheelpaths per trafficked lane (see also IWP and OWP).
XSP	Cross Sectional position that indicates the Lane numbering convention (refer to RAMS – Lane Numbering).

2 EQUIPMENT

2.1 GENERAL

Measure and record data using a SCRIM with the equipment described in Test Method TfNSW T189.

The minimum requirements for all equipment must be in accordance with Test Method TfNSW T189 and the manufacturer's specifications. Ensure that measuring equipment is maintained in calibration and good working order.

Traffic control devices mounted on the vehicle (e.g. Signposting, lights, etc) and any other items required for the Works must also be provided to comply with Specification TfNSW G22.

2.2 LOCATION REFERENCING DEVICES

2.2.1 TfNSW Linear Referencing System (ROADLOC)

Reference all data to the TfNSW Linear Referencing System (ROADLOC). The features and terms used are described in the document "RAMS – Linear Referencing".

The distance calculated for each ROADLOC LINK must be within the range:

- TfNSW LINK LENGTH ± [the greater of 10 m or (0.5% x ROADLOC LINK LENGTH)].

The TfNSW Linear Referencing System is described in Annexure M923/E1.

2.2.2 Global Positioning (GPS)

When specified in Annexure M923/A, GPS must be collected to supplement the location reference system.

The GPS coordinates recorded must reference the Geocentric Datum of Australia 1994 datum (GDA94).

The GPS equipment must have the capability specified in Table M923.1.

Table M923.1 – Minimum Equipment Requirements for GPS

Parameter	Requirements
Instrument Type	Differential GPS
Resolution	Data to be provided in decimal degrees either to double precision or with a minimum of 12 significant digits.
Minimum Sampling Rate	10 Hz
Operating Temperature Range	0°C - 40°C
Repeatability	95% of readings within: - 2.5 m Horizontal - 5 m Vertical

The location of each data record must be identified by the horizontal and vertical coordinates.

If GPS is used as the primary method of Road Location Referencing, then the PROJECT QUALITY PLAN must include the procedure to validate the accuracy of GPS and the procedure to deal with areas where coverage is substandard. The PROJECT QUALITY PLAN must provide for analysis of GPS location to verify direction and lane identification entered by the operator.

2.3 STRAIN AND LOAD DEVICES (SKID RESISTANCE)

The SCRIM must be capable of measuring and recording the horizontal load on the test wheel during testing.

2.4 OPERATOR INTERFACE

The electronic data acquisition system of hardware and software must facilitate real time interaction with the operator to provide:

(a) Heading data;

(b) Events;

(c) Comments.

Events are instances encountered during the survey that may affect the data being collected and make it not typical of the road Interval. Use the Event Codes described in Test Method TfNSW T189 to identify each data record affected by the Event. Events must be immediately recorded and location referenced while the survey is in progress.

3 COLLECTION

3.1 GENERAL

The Works include initial Validation, Survey of the road network using SCRIM, real time processing of data and storage during the Survey and Close-out.

Undertake the survey in accordance with this Specification and WHS requirements. As part of WHS requirements, include driver fatigue management and breaks of at least every 2 hours.

Ensure that all the requirements in Test Method TfNSW T189 are incorporated into the PROJECT QUALITY PLAN and that the PROJECT QUALITY PLAN is implemented. The Inspection and Test Plan must nominate the proposed testing frequency to verify conformity of the item. The proposed testing frequency must not be less than the frequency specified in Test Method TfNSW T189. Where a minimum frequency is not specified, nominate an appropriate frequency.

Carrying out the survey for the Principal does not automatically give you special privileges and all traffic laws must be obeyed.

Where the work requires testing of specially designated lanes (e.g. Bus lanes, Transit lanes) ensure that permission to test is granted in advance.

When specified in Annexure M923/A, the Operator will liaise with the TMC Operations Room during the survey for traffic signal green light runs.

Applications for “traffic signal green light runs” must be made at least 14 days prior to the proposed date of survey. The Principal is not responsible for delays that result should the proposed dates not be acceptable.

3.2 CONTRACT PROGRAM

Select the order to survey the roads to efficiently comply with the Specification.

The Contract Program must detail the roads to be surveyed by date, the equipment and personnel involved, and when data will be available to the Principal.

Ensure that the Contract Program makes allowance for:

(a) meeting WHS and traffic requirements (TfNSW G22);

(b) time taken to process applications for green light corridors from the TMC (i.e. traffic signal green light runs);

(c) conditions for traffic signal green light runs (refer to Clause 3.1);

(d) avoiding lanes while the configuration is in a Tidal flow configuration or temporary reduced speed (e.g. School Zones);

(e) kerbside lanes subject to parking that are sometimes inaccessible due to parked vehicles.

HOLD POINT

Process Held:	Commencement of survey.
Submission Details:	At least 7 days before the proposed date of commencement, provide the following details: (a) Validation details for each SCRIM technician and driver. (b) The Contract Program.
Release of Hold Point:	The Principal will consider the submitted data prior to authorising the release of the Hold Point.

At the period specified in Annexure M923/B, submit a written progress report to the Principal that includes:

(i) Progress against the Contract Program (e.g. a list of roads completed and current location);

(ii) Notification of any nonconformity with the approved PROJECT QUALITY PLAN (refer to TfNSW Q);

(iii) Progress with data processing;

(iv) Other issues.

3.3 VALIDATION

Within 5 days of commencing survey, conduct a Validation test to demonstrate conformity of the PROJECT QUALITY PLAN, SCRIM technician and driver. In addition, the Principal may require a Validation Test where:

(a) Nonconformity occurs in a Validation Test;

(b) In the PROJECT QUALITY PLAN, SCRIM technician or driver is changed;

(c) Work does not comply with this Specification.

Nominate a length of road from the Schedule of Works as the Validation Site that meets the following criteria:

(i) Pavement surface that is typical of the network to be surveyed;

(ii) A length of 1.0 lane km where the test speed is maintained;

(iii) Located where the pavement surface will not be altered over the duration of the survey.

WITNESS POINT

Process to be Witnessed: Validation test.

Submission Details: At least 3 days notice of intention to test the Validation Site.

Test the Validation Site with 5 consecutive runs. The first validation run is used to wet the pavement surface and the results must be excluded from the validation analysis.

"Average Percentage Difference" is the overall average of the percentage differences for each 5 m section, between the average of the four runs of the proposed operational device and the corresponding four run average of the data. It is obtained using the following equation:

$$\text{Average Percentage Difference} = \frac{\sum_{1}^{n} \frac{(A_n - B_n)}{B_n} \times 100}{n}$$

Where

A_n = SR reading of n^{th} 5 m section, obtained by the proposed operational SCRIM measuring device;

B_n = Average SR value obtained from the four runs for n^{th} 5 m section; and

n = Total number of 5 m sections in analysis.

Supply all the data collected from the Validation Site in the database as described in Annexure M923/L. All fields in the database must be populated with the actual data recorded (i.e. includes skid resistance in both wheelpaths and the maximum difference).

The Principal will assess the repeat runs at the Validation Site for each SCRIM technician and driver combination. Where the Average Percent Difference (APD) does not meet the criteria in Table M923.2, the data collected by the SCRIM and driver combination is nonconforming. Until the nonconformity is rectified, the offending SCRIM technician and driver are deemed to be no longer accredited.

Table M923.2 – Conformity Criteria

Data Item	Average Percent Difference (APD)
SR_{LWP}	±5
SR_{RWP}	±5

Note: $SR = 100 * SFC_{50}$

The data submitted also forms the basis for assessing the Close-out in Clause 3.5.

3.4 SURVEY

3.4.1 General

The SCRIM must be operated in accordance with Test Method TfNSW T189. Ensure that the correct speed range is maintained. Where "green light" runs are planned, liaise with the TMC Operations Room during the survey.

Reference all data records using the location reference system nominated in Clause 2.2.

Record the road surface and ambient temperature at least every two hours together with the location reference.

3.4.2 Direction and Lane Identification

Test the most trafficked lane as specified in Test Method TfNSW T189, except where the required survey lane(s) is nominated by the Principal in Annexure M923/E.

Reference the direction of survey (i.e. Prescribed or Counter) and the actual lane surveyed during data collection in accordance with the document "RAMS – Lane Numbering". Update the lane whenever the vehicle deviates from the lane. Minimise deviation out of the nominated lane during a survey.

3.5 CLOSE-OUT

Notify the Principal of the date when the required field work has been completed (i.e. the survey completion date).

Within 28 days after the survey completion date, conduct Close-out by retesting the Validation Site (refer to Clause 3.3). Validation to be performed by the SCRIM technician and driver used for the survey.

WITNESS POINT

Process to be Witnessed: Close-out.

Submission Details:	At least 3 days notice of intention to Close-out and test the Validation Site.

HOLD POINT

Process Held:	Completion of the survey.
Submission Details:	Within 5 days of completing Close-out and testing Validation Site, provide all the data of the road sections in the Database format and clearly identify each SCRIM technician and driver.
Release of Hold Point:	The Principal will consider the correlation (i.e. using r^2) between the Close-out survey and the Validation Site for each SCRIM technician and driver combination prior to authorising the release of the Hold Point.

Where a Correlation Coefficient does not meet the criteria in Table M923.2, the data collected by the SCRIM technician and driver combination is nonconforming.

4 REPORTING

4.1 GENERAL

Data reporting includes processing of data following the survey, quality verification, flagging, calculations, and storage of the data into the specified database format and supplying the data.

Reporting must commence within 14 days of the data being collected and must progress at a consistent rate thereafter.

Ensure that the following are performed:

(a) Data is reported at the nominated distance Interval as referenced from the start Node of each ROADLOC Link and progressing in the Prescribed Direction;

(b) Data collected in the Counter Direction has been processed and stored in the Prescribed Direction;

(c) The conformity of the data collected and processed during the survey is assessed against the PROJECT QUALITY PLAN;

(d) Data is appropriately flagged in accordance with Clause 5.

At completion of each survey, submit two (2) complete and final sets of all required data on DVD or CD.

Retain all data arising from the survey and the means of reprocessing the data for a period of 5 years from the completion date of each survey.

4.2 PROCESSING DATA

Process the data to provide the skid resistance data specified in Annexure M923/L. Ensure that only conforming data is used to determine and report the data items.

Use the computer analysis program developed by TfNSW to consistently:

(a) Calculate each SCRIM Reading, SR (i.e. $SR_{RAW} = 100*SFC_{RAW}$).

(b) Standardise SR for speed and temperature in accordance with Section 2.3, Appendix 2 of RTA/VicRoads publication, Guide to the Measurement and Interpretation of Skid Resistance Using SCRIM.

Analyse the corrected SR data in each wheelpath separately.

Calculate by means of a four point rolling average on all data, by replacing the value for a point by the mean of the values of that point and the three previous points and reports for each 100 m section the minimum value of all the data for each wheelpath as the section skid resistance.

Determine for each 100 m interval the following data based on the four point analysis:

(i) The minimum Left SR;

(ii) The minimum Right SR;

(iii) The maximum difference between Left and Right SR.

Where an Interval has more than one type of Event Code, report the worst case Event Code for the Interval (e.g. an Event Code that identifies nonconformity takes precedence over others). Include the relative importance of Event Codes in the PROJECT QUALITY PLAN.

All data must be reported in the Prescribed Direction. Where the Counter Direction is surveyed, ensure that the data is adjusted so that it is correctly referenced and reported in the Prescribed Direction.

In addition, the following applies where multiple lanes in the same direction of traffic are also part of the survey:

- Any part of a lane that has not been tested (e.g. owing to deviation into another lane) must be recorded as "Missing Data";
- Data from an adjacent lane must not be substituted to replace "Missing Data", unless approved otherwise by the Principal.

5 OTHER CONFORMITY REQUIREMENTS

5.1 GENERAL

Statistical analysis is generally used to assess conformity of the Works.

The Lot that is referred to in TfNSW Q corresponds to the data that has been collected from a continuous run using the same SCRIM technician and driver.

"Missing Data" (i.e. to be recorded -99) is nonconforming.

5.2 DATA FLAGS

All data that is processed into the required Interval must be flagged in the database by the Data Flags described in Table M923.3. Reasons for nonconformity include, but are not limited to, the following:

(a) Data collected that does not comply with the requirements in Test Method TfNSW T189, and includes:

  (i) Outside the speed constraints;

  (ii) Wheel in the up position;

  (iii) Data collected when the road surface was too wet;

  (iv) Out-of-wheelpath sections.

(b) Data collected through a lane with roadworks.

(c) Data where the LINK length does not conform.

(d) Data collected by an unaccredited SCRIM technician and driver.

Table M923.3 – Data Flags for Processed Data

Reason	Data Flag	Extent	Examples
Conforming data	A	Each Interval	
Nonconforming data – Link length nonconformity	L	Each Interval	Measured LINK shorter or longer than specified.
Nonconforming data	Z	Each Interval	• Wheel up • Roadworks • Out of lane • Out-of-wheelpath

5.3 NONCONFORMITY REPORTING

Submit a Nonconformity Report in accordance with TfNSW Q for all data that is nonconforming. The minimum requirements for the report are summarised as follows:

(a) Details of Nonconformity.

(b) Date.

(c) Road Number.

(d) Carriageway.

(e) Location Reference:

  (i) Link;

  (ii) Coordinates (where GPS is required).

(f) Direction and Lane affected.

(g) Reason for Nonconformity.

(h) Proposed rectification.

(i) Corrective action.

ANNEXURE M923 /A – PROJECT SPECIFIC REQUIREMENTS

A1 EXTENT OF WORK

Minimum extent of test points collected - 95 % of total nominated lane kms, Left SR (Clause 1.3.1).

Minimum extent of test points collected - 95 % of total nominated lane kms, Right SR (Clause 1.3.1).

Table M923/A.1 – Example of Schedule of Works

Road Name	Road No	Local Road Name	Link No	riageway C	Version No	Sectional P	Begin Offse	End Offset	tem Length	Start Description	Stert Location	End Description	End Location	Length
FIVE DOCK-DRUMMOYNE	395	GREAT NORTH RD, FIVE DOCK	30	A	2	PT1	0.18	0.581	0.401	START FLEX PAVEMENT	FIVE DOCK	LYONS RD	RUSSELL LEA	0.581
FIVE DOCK-DRUMMOYNE	395	BAYSWATER ST, DRUMMOYNE	110	B	1	PT1	0	0.474	0.474	LYONS RD	DRUMMOYNE	WESTBOURNE ST	DRUMMOYNE	0.474
FIVE DOCK-DRUMMOYNE	395	BAYSWATER ST, DRUMMOYNE	110	B	1	PT2	0	0.474	0.474	LYONS RD	DRUMMOYNE	WESTBOURNE ST	DRUMMOYNE	0.474
FIVE DOCK-DRUMMOYNE	395	BAYSWATER ST, DRUMMOYNE	110	B	1	PT3	0	0.42	0.42	LYONS RD	DRUMMOYNE	WESTBOURNE ST	DRUMMOYNE	0.474
FIVE DOCK-DRUMMOYNE	395	WESTBOURNE ST, DRUMMOYNE	120	A	1	PT1	0	0.149	0.149	THE ESPLANADE	DRUMMOYNE	MARLBOROUGH ST	DRUMMOYNE	0.149
FIVE DOCK-DRUMMOYNE	395	WESTBOURNE ST, DRUMMOYNE	130	A	1	PT1	0	0.147	0.147	HINKLER CT	DRUMMOYNE	VICTORIA RD	HUNTERS HILL	0.147

Table M923/A.2 – Other Requirements

Clause	Description	Required
2.2.2	Global positioning (GPS)	Yes / No
3.1	Traffic signal green light runs	Yes / No
3.3	Validation	Yes / No
3.5	Close-out survey	Yes / No

ANNEXURE M923/B – MEASUREMENT AND PAYMENT AND RESOLUTION OF NONCONFORMITIES

B1 MEASUREMENT

Table M923/B.1 – Project Requirements

Clause	Item	Project Requirement
1.3.1	Location of Work	As specified by the Principal.
1.3.1	Schedule of Works detailing roads to be surveyed	• The Linear References for the Start and End of each road Link to be surveyed. • The total carriageway length for each Link. • The list of Lanes to be surveyed by Road, Link, Carriageway, Direction and Length.
1.3.2	Additional information provided by the Principal	• A soft copy of the Link Summary for the relevant roads at the commencement of the Contract. • An MS Access data base with a table containing the list of Lanes to be surveyed by Road, Link and Length. • A soft copy of the MS Access database to be populated. • Where GPS is required, a copy of the TfNSW road network model.
2.2	Supplementary Location Referencing System(s)	None or GPS
3.2	Frequency for progress report	Every 2 weeks

B2 DISPOSITION OF NONCONFORMITIES

The Principal may accept rectification of data by reprocessing the data where the Contractor can demonstrate that the PROJECT QUALITY PLAN has not been followed in regard to processing the data.

Nonconformities in the data items may be accepted by the Principal subject to a reduction in the quantity by an amount equal to the length that contains nonconforming data.

The minimum extent of network surveyed that may be accepted by the Principal is specified in Annexure M923/A1.

B3 PAYMENT

Payment will be made for all costs associated with completing the work detailed in this Specification in accordance with the following Pay Item.

Where no specific pay items are provided for a particular item of work, the costs associated with that item of work are deemed to be included in the rates and prices generally for the Work Under the Contract.

The rate for this pay item may be subject to a "Rise and Fall" where provided in the Contract.

A lump sum price for this item will not be accepted.

Costs satisfying the requirements for Quality Assurance must be borne by you (e.g. Validation processes). The cost of rectifying nonconformities must be borne by you.

Where the data is rejected because of its failure to meet the requirements of this Specification, all costs associated with rectification, including replacement or correction of the data and any extra costs incurred by you in respect of delays caused by such replacements, must be borne by you.

Missing data or nonconforming data must be excluded from the quantity calculated as a basis for payment.

Table M923/B.2 – Pay Items

Pay Item No.	Description	Unit
M923P1	**Collection and reporting of SCRIM data at 100 m Intervals.** Includes all costs associated with collection, processing, storage and reporting of skid resistance in both wheelpaths and the maximum differential. The unit is lane kilometres. The quantity is the sum of the Interval lengths that have conforming data as determined by the Principal's Location Referencing System. The quantity includes the first series of 5 repeat runs at Close-out. Excludes the second and subsequent test of the Validation Site. Excludes the second and subsequent surveys at Close-out. Excludes nonconforming or rejected data.	**km**

ANNEXURE M923/C – SCHEDULES OF HOLD POINTS, WITNESS POINTS AND IDENTIFIED RECORDS

Refer to Clause 1.3.4.

C1 SCHEDULE OF HOLD POINTS AND WITNESS POINTS

Clause	Type	Description
TfNSW Q	Hold	As specified.
Contract Documents	Hold	Certificate of Currency for each required Insurance.
3.2	Hold	Submission of the following: (a) Validation details for each SCRIM technician and driver; (b) The Contract Program.
3.3	Witness	Validation Test.
3.5	Witness	Close-out (and Validation Test).
3.5	Hold	Submission of all the data of the road sections in the Database format and clearly identify each SCRIM technician and driver.

C2 SCHEDULE OF IDENTIFIED RECORDS

The records listed below are Identified Records for the purposes of TfNSW Q Annexure Q/E.

Clause	Description of Identified Record
2.1	Calibration reports required in TfNSW T189 that include: (a) Test wheel weight (load); (b) Odometer; (c) Water flow; (d) Test tyre pressure.
3.2	Validation for each technician and driver.
3.3	Test data of the Validation Site.
3.5	Test data at Close-out.
4.2	Data collected from the SCRIM prior to any processing (i.e. SFC_{RAW}).

ANNEXURE M923/D—PLANNING DOCUMENTS

Refer to Clause 1.3.5.

The following documents are a summary of documents that must be included in the PROJECT QUALITY PLAN. The requirements of this Specification and others included in the Contract must be reviewed to determine additional documentation requirements.

Clause	Description
2.2.2	Procedure to validate accuracy of GPS and deal with areas of substandard coverage and provision for analysis of GPS location
3.1	Requirements in Test Method TfNSW T189
3.2	Contract Program
3.3	Competence of SCRIM technician and driver
3.3	Change of SCRIM technician or driver
4.2	Relative importance of Event Codes

ANNEXURE M923/E – TECHNICAL REQUIREMENTS

E1 TFNSW LINEAR REFERENCING SYSTEM

Where the specified location referencing is ROADLOC, reference all data to the TfNSW's Linear Referencing System described in the document "RAMS – Linear Referencing".

Ensure that the correct ROADLOC Nodes are selected. Reset the distance measured to zero directly adjacent to the identified Node.

The nominated lane surveyed is to be identified in the database by the lane numbering convention described in the document "RAMS – Lane Numbering", as the Lane Code.

Where the survey is interrupted or stopped within a Link and GPS to the required accuracy is not available, recommence the survey at the Node or a reference feature preceding where the Incident was first encountered. Otherwise, recommence so that the complete data can be established.

E2 ALTERNATIVE PROCEDURE TO ADJUST RECORDS WITH DIFFERING LINK LENGTH

The following procedure is an option to fit the defined Node points.

The procedure is applied where the length surveyed is not exactly the same as the ROADLOC Link.

The residual length of lane that is less than the specified Interval closes the Link and this is adjusted.

Where the Link length surveyed conforms to the tolerance in Clause 2.2.1, the LENGTH is adjusted using Scenario A, B or C as appropriate.

Where the Link length surveyed does not conform to Clause 2.2.1, use Scenario L.

Scenario A

Where the length surveyed and the ROADLOC length fall within the same Interval:

(a) Change the field "CH_TO" to the ROADLOC length.

(b) Record the field "LENGTH" as the length surveyed.

Example A.1: Surveyed length = 5.115, ROADLOC = 5.123

CH_FR	CH_TO	LENGTH
5.000	5.100	0.100
5.100	5.123	0.015 i.e. 5.115 - 5.100

Example A.2: Surveyed length = 5.147, ROADLOC = 5.123

CH_FR	CH_TO	LENGTH
5.000	5.100	0.100
5.100	5.123	0.047 i.e. 5.147 - 5.100

Scenario B

Where the measured length falls into the previous Interval (i.e. in Prescribed Direction):

(a) In the last record for the Link:

(i) Change the field "CH_TO" to the ROADLOC length.

(ii) Record the field "LENGTH" as the length surveyed.

The record will then represent more than 100 m.

Example B.1: Surveyed length = 8.097. ROADLOC = 8.115

CH_FR	CH_TO	LENGTH
7.900	8.000	0.100
8.000	8.115	0.097 i.e. 8.097 - 8.000

Scenario C

Where the measured length falls into the next Interval:

(a) In the second last record:

(i) Change the field "CH_TO" to the ROADLOC length.

(ii) Change the field "LENGTH" to the length surveyed.

(iii) Include in the Comments field that the length surveyed exceeded the ROADLOC length.

(b) Report the Data Items over the actual Interval Length.

(c) Delete the last record.

Example C.1: Surveyed length = 7.715, ROADLOC = 7.690

CH_FR	CH_TO	LENGTH	Comments
7.500	7.600	0.100	
7.600	7.690	0.115 i.e. 7.715 - 7.600	Length exceeds by 0.015
~~7.700~~	~~7.715~~	~~0.015~~ Delete Last Record	

Scenario L: Nonconforming Length

Where the Link length surveyed does not comply with the distance tolerance specified in Clause 2.2.1, the Link is nonconforming and is reported as a nonconformity:

(a) Flag the record in accordance with Clause 5.2.

(b) Include in the Comments field that the length measured exceeded the tolerance and the discrepancy.

(c) Make NO adjustment to the data.

(d) Ensure that the Nonconformity Report has been provided in accordance with Clause 5.3.

E3 CARRIAGEWAY AND LANE CODES

Table M923/E.1 – Carriageway and Lane Codes

Carriageway Reference	Lane Reference
”A” Carriageways surveyed in the Prescribed and Counter Direction.	• Lane Code PT1, PT2, PT3, PT4, PT5, PT6. • Lane Code CT1, CT2, CT3, CT4, CT5, CT6.
“B” Carriageways surveyed in the Prescribed Direction.	• Lane Code PT1, PT2, PT3, PT4, PT5, PT6.
“C” Carriageways surveyed in the Counter Direction.	• Lane Code CT1, CT2, CT3, CT4, CT5, CT6.
“D” “E” “F” “G” “K” “L” Carriageways.	Test all lengths that appear in the schedule
“R” “S” “T” “U” “V” “W” “X” “Y” Carriageways.	Test all lengths that appear in the schedule, including ramps
Exceptions (not generally surveyed)	• Parking bays where traffic calming devices create a parking zone. • Short bus bays or bus lanes < 50 m. • Traffic devices. • Separate Bus Transitways.

ANNEXURES M923/F TO M923/K – (NOT USED)

ANNEXURE M923/L – DATABASE FORMAT

L1 DATABASE FORMAT

The data parameters required are described in the following table.

Table M923/L.1 – Primary Database Field Formats

FIELD NAME	DATABASE FIELD DESCRIPTION	FIELD FORMAT
Filename	Filename of the survey file from the header information.	String
Test Date	Testing Date	Number
NE_Unique	Calculated as (Road No, Link No, C'way)	String
Road No	Road Number of road surveyed	Integer
Road Name	Name of Road.	String
Link No	Link Number	Integer
Chainage_From	Start of Chainage	Integer
Chainage_To	End of Chainage	Integer
Cway	Link Carriageway Code	String
Direction	RAMS XSP Lane reference	Text
Left SRA	Minimum Left SCRIM Reading	Integer
Right SRA	Minimum Right SCRIM Reading	Integer
Diff SR	Maximum Differential SCRIM Reading	Integer
Site Cat	Site Category	Integer
Investigate	Flag suggesting Investigation	Text
LanesOnSite	Count of Lanes on Site at start of test using a new file	Integer
LanesTested	Lane of the survey at start of test using a new file	Integer
Speed	Truck Speed	Integer
Pav Temp	Pavement Temperature °C	Integer
Comments	Comments	String
Events	Event Codes and Description of activities.	String
Dflag	Data Flag	Text
X_From	Start Horizontal “X” Coordinate	Double
Y_From	Start Horizontal “Y” Coordinate	Double
~~Z_From~~	~~Start Vertical “Z” Coordinate~~	~~Double~~
X_To	End Horizontal “X” Coordinate	Double
Y_To	End Horizontal “Y” Coordinate	Double
~~Z_To~~	~~End Vertical “Z” Coordinate~~	~~Double~~

ANNEXURE M923/M – REFERENCED DOCUMENTS

Refer to Clause 1.3.8.

TfNSW Specifications

TfNSW G22	Work Health and Safety (Construction Work)
TfNSW Q	Quality Management System

TfNSW Test Methods

TfNSW T189	Determination of Skid Resistance by Sideways Force Measuring Equipment

TfNSW Guidelines

RAMS – Linear Referencing

RAMS – Lane Numbering

Road Occupancy Manual

Guide to the Measurement and Interpretation of Skid Resistance Using SCRIM