

SCANNER Surveys for Local Roads

Specification Volume 4
Quality Assurance and Audit

July 2005

Halcrow Group Limited

Halcrow

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Acknowledgement

This specification is substantially based on the original "TRACS Type Surveys for the Principal Road Network- Specification and Advice Note" produced for the UK Roads Board by Chris Britton Consultancy and TRL. It incorporates many detailed changes based on experience of using the TTS specification in 2003/04 and 2004/05 and a wide range of comments from interested parties and includes the results of the initial research. In addition the style has been changed to be consistent with new styles of contract (i.e. "the contractor carries out surveys", rather than, "the contractor shall survey").

Considerable assistance and support has been given by: TRL, UKPMS Development Support Consultant (Chris Britton Consultancy), Survey Contractors, UKPMS developers, and members of the SCANNER Implementation Advisory Group.

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Foreword

This document is one of a series of five describing the complete process of carrying out SCANNER Surveys (Surface Condition Assessment of the National Network of Roads):

The five Volumes are:

1. Advice to Local Authorities
2. Specification for Services
3. Acceptance Testing and Accreditation
4. Quality Assurance and Audit
5. Further Technical Guidance

This Volume, Quality Assurance and Audit contains details of the Quality Assurance procedures to ensure Services are consistent and reliable and is to be read in conjunction with the other documents. It includes audit processes, monitoring, calibration, and requirements for repeat surveys.

Volume 1 contains advice to Local Authorities about the Services to be provided under the SCANNER Specification. It contains background information about the development of SCANNER surveys from TTS and TRACS. It includes advice on contact procurement and mobilisation. It includes a glossary of technical terms and a model contact document as annexes.

Volume 2, Specification for Services contains details of survey procedures, data processing, route fitting and calculations of derived parameters.

Volume 3, Acceptance Testing and Accreditation, describes the requirements for testing survey vehicles to become accredited by site and network tests. It describes the requirements for the reporting and delivery of survey data from SCANNER accredited Surveys.

Volume 5, Further Technical Guidance explains the background to SCANNER Surveys and gives further guidance on the interpretation of processed SCANNER data.

Introduction

- 1.1.1* The purpose of Quality Assurance (QA) is to give the Employer and the Department for Transport confidence that the data and results provided are reliably consistent and suitable for purpose. The purpose of Audit is to ensure that Quality Assurance procedures are operating effectively.
- 1.1.2* The data collected by the Contractor using SCANNER accredited Equipment must have a high level of repeatability and reproducibility. The QA and Audit procedures described in this document are applied to ensure that a high level of repeatability and reproducibility is maintained and the data provided by the Contractor are consistent and remain valid throughout the duration of the SCANNER accredited surveys.
- 1.1.3* In order to provide comprehensive Quality Assurance for SCANNER accredited surveys, QA is provided by a combination of 'first party' QA, operated by the Contractor and 'third party' Audit, provided by an independent Auditor.
- 1.1.4* This document sets out the requirements for Quality Assurance, operated by each Contractor and for Audit provided by an independent Auditor.
- 1.1.5* The Contractor provides and operates an effective QA regime.
- 1.1.6* Although many local highway authorities commission SCANNER accredited surveys through consortium arrangements, there are many more Employers than accredited survey vehicles. It is therefore more cost effective to base the QA and Audit procedures on the comparatively smaller number of accredited survey vehicles, rather than on the larger number of Employers.
- 1.1.7* As many English local highway authorities have relatively short principal and classified road networks, it is more practical and cost effective to apply QA and Audit testing on a selective sample basis, rather than individually on each Employer's road network.
- 1.1.8* However, all local authorities and the Department for Transport require effective QA and audit arrangements and to know how they have been applied to SCANNER accredited surveys carried out on local road networks.

- 1.1.9* Therefore the Department for Transport, on behalf of the Roads Board, employs an independent Auditor to audit the Contractor's QA regime and provide independent Audit services on behalf of English local highway authorities. Thus all local authorities (the Employers) and the Department for Transport can be confident that the data and results from SCANNER accredited surveys are suitable to support local maintenance management and for local and national performance monitoring. A summary of the requirements of the Accreditation, QA and Audit Testing contract is attached at Annex A.
- 1.1.10* The QA procedures are based on an interlocking series of daily, weekly, monthly and quarterly checks of the operation and performance of the accredited Equipment by the Contractor with independent Audit that the procedures are being followed, and independent re-surveying of a limited number of sample sites.
- 1.1.11* The Employer should specify in any contract that the Contractor is required to deliver any Quality Assurance tests and data required by the specification for SCANNER accredited surveys within the overall price agreed with the Employer for the surveys of the Employer's road network.
- 1.1.12* The Employer should also specify in any contract that the Contractor is required to deliver any reports required by the specification for SCANNER accredited surveys to the Employer and to the Auditor promptly in accordance with the timescales defined by the specification. This includes reporting any repairs or alterations carried out on the SCANNER accredited Equipment.
- 1.1.13* As a matter of principle, the Auditor has the right to ask for any and all information but will normally only ask for a sample of data sufficient to be satisfied that the Equipment is being operated satisfactorily in accordance with the Specification.
- 1.1.14* The Auditor provides a brief written monthly report on the overall progress of the SCANNER surveys to the Department for Transport.

2 Accreditation requirements

2.1 *General Requirements*

- 2.1.1 Before carrying out any SCANNER accredited surveys the Equipment must have a currently valid Accreditation Certificate following successful Acceptance Testing or annual Accreditation re-testing. The requirements for Acceptance and Accreditation are set out in Volume 3 of SCANNER surveys for local roads.
- 2.1.2 The Employer should specify in any contract for SCANNER accredited surveys that surveys may only be carried out by Equipment with a currently valid Accreditation Certificate.
- 2.1.3 Following the successful completion of Acceptance Tests the Equipment is initially accredited for carrying out SCANNER accredited surveys for a period of not more than 15 months from the date of the completion of the tests.
- 2.1.4 At intervals of not more than one year following the successful completion of the acceptance tests the Equipment undergoes annual re-testing. Following the successful completion of re-testing the Equipment is accredited for carrying out SCANNER accredited surveys for a further period of 12 months.
- 2.1.5 The Acceptance Tester may assess the competence of drivers and operatives as part of the Acceptance Testing and the annual re-testing.
- 2.1.6 The Auditor and/or the Employer may require the Contractor to produce a currently valid Accreditation Certificate for the Equipment at any time.

3 Contractor's Quality Assurance Regime

3.1 *General requirements*

3.1.1 The Contractor provides and operates an effective and documented Quality Assurance regime covering all aspects of the SCANNER accredited surveys, including, but not limited to:

- vehicle operation and maintenance
- driver and operative training and instruction
- survey operation and record keeping
- data recording, processing, and analysis
- delivery of survey results

3.1.2 The Auditor may require the Contractor to demonstrate any aspect of the Quality Assurance regime at any time, including documentation and performance.

3.1.3 When carrying out SCANNER accredited surveys the accredited Equipment may only be driven and operated by competent drivers and operatives. The Contractor is responsible for the training and instruction of all drivers and operatives and for ensuring that they comply with the Employer's and the Contractor's requirements and the requirements for SCANNER accredited surveys.

3.1.4 The Auditor may assess the competence of drivers and operatives carrying out SCANNER accredited surveys at any time. If, in the Auditor's opinion, there are concerns about the competence of drivers or operators to carry out the surveys effectively, the Auditor reports these concerns to the Contractor. The Auditor may review the driver or operator's performance against the criteria set out in the Contractor's training documentation and method statements. If the Contractor is unable to resolve the Auditor's concerns about the competence of drivers or operatives, the Auditor may report these concerns to any Employer affected and to the Department for Transport.

3.1.5 If the Auditor considers a lack of driver or operator competence may affect the ability of the Contractor to perform effective SCANNER accredited surveys, the Auditor may suspend or revoke any current Accreditation Certificate when the Equipment is driven or operated by those whose competence is in doubt until

competence to operate the Equipment has been demonstrated by a re-test, carried out by those drivers and/or operatives whose competence is in doubt.

4 Contractor's Regular Checks

4.1 *General requirements*

4.1.1 The Contractor operates the system for demonstrating continued satisfactory operation of the accredited Equipment to the SCANNER specification.

4.1.2 The approach is based on three levels of reference standard:

- Primary and Principal reference sites – the 'gold' standard
- Secondary reference sites – the 'silver' standard
- Daily test sites – the 'bronze' standard

4.1.3 The SCANNER specification requires four main elements

- The establishment of one "Primary Reference Site" and the testing of satisfactory operation of the Equipment at the Primary Reference Site at least once every 13 weeks (quarterly tests).
- The establishment of one or more "Principal Reference Sites" and the testing of satisfactory operation of the Equipment at one or other of the Principal Reference Sites or the Primary Reference Site at least once every month (monthly tests).
- The establishment of one or more "Secondary Reference Sites" and the testing of satisfactory operation of the Equipment at one or other of the Secondary Reference Sites or the Primary Reference Site or a Principal Reference Site at least once every 7 days (weekly tests).
- The establishment of one or more "daily test sites" and the testing of satisfactory operation of the Equipment at the same daily test site at the beginning and end of each days surveying.

4.1.4 There are special requirements for checks on the identification of cracking. These requirements are described in Section 4.10.

4.2 *Primary Reference Site*

4.2.1 The Contractor selects and establishes the performance of the Equipment at the Primary Reference Site within 7 days immediately following the successful completion of Acceptance Testing or any subsequent re-testing.

- 4.2.2 For operational convenience, it is likely that the Primary Reference Site will be located close to the Contractor's main operational base. Other Principal Reference Sites may be located anywhere within the country, to support the Contractor's survey operations.
- 4.2.3 The Contractor informs the Auditor of the Primary Reference Site it has chosen. The Auditor may carry out an independent survey of the Primary Reference Site at any time.
- 4.2.4 The Contractor surveys its Primary Reference Site with each accredited Equipment within 7 days immediately following the successful completion of Acceptance Testing or subsequent re-testing of each item of Equipment, to provide a reference data set. The Contractor may carry out more than one survey at each site as a measure of consistency and repeatability of the Equipment.
- 4.2.5 The Contractor processes the survey data collected from the Primary Reference Site to obtain the parameters given in Table 4.2.1, and reports them to the Auditor within 14 days immediately following the successful completion of Acceptance Testing or subsequent re-testing.
- 4.2.6 The Contractor and the Auditor store these parameters as a reference data set for future comparison with subsequent re-surveys of the Primary Reference Site. These data sets are the "Reference Data Set" for the Primary Reference Site.
- 4.2.7 If the condition of the Primary Reference site is affected by maintenance or other external factors at any time during the year, the Contractor reports this fact to the Auditor and the Contractor may either establish the changed characteristics of the site by repeated testing or establish another site as a replacement Primary Reference Site.

Parameter	Units	Reporting Interval ¹
Location Referencing - Length of Surveyed Check Site	m	N/A
Location Referencing - National Grid Co-ordinate	m	10m
Location Referencing - Altitude	m	10m
Longitudinal Profile - 3 m Variance	mm ²	10m
Longitudinal Profile - 10 m Variance	mm ²	10m
Longitudinal Profile - 30 m Variance	mm ²	10m
Transverse Profile - Individual Rut Depths ²	mm	10m
Texture Profile - SMTD	mm	10m
Cracking ³ - Crack Map or Grid	n/a	N/A
Alignment - Gradient	%	10m
Alignment - Crossfall	%	10m
Alignment - Curvature	m ⁻¹	10m

¹The parameters shall be averaged over the length indicated

²Both Nearside and Offside Rut Depth shall be calculated

³See Section 4.10

Table 4.2.1: Derived parameters to be calculated from the Survey

Data for Monthly, Weekly and Daily Checks

4.3

Reference Site Characteristics

4.3.1

The Contractor chooses reference test sites (both the Primary Reference Site and other reference sites) such that large changes in the parameters to be measured by the accredited Equipment should not occur over the period during which it is used for checking the accredited Equipment. It is therefore desirable that the sites should not be heavily trafficked.

4.3.2

The reference sites should be reasonably flat and have a length of at least 400m without any sharp bends or extremes of profile unevenness and texture. The sites should also be free of any isolated surface defects.

- 4.3.3 The start and end points of the sites should be durably marked on the kerb or road surface. The Contractor consults the local highway authority responsible for the reference test site and obtains its agreement before making any marking on or modification of the site.
- 4.3.4 The Contractor measures the length of each site (between 400m and 1km), to an accuracy of $\pm 0.5\text{m}$, using a calibrated distance measuring wheel or other reliable device, for use in checking the accuracy of the measurement of distance travelled.
- 4.4 ***Regular 'Quarterly' Checks***
- 4.4.1 In order to maintain control over possible changes in the measurement accuracy of the Equipment the Contractor carries out, at its own cost, regular 'quarterly' checks of the survey data from the Primary Reference Site against the Reference Data Set previously collected on the same Primary Reference Site.
- 4.4.2 The Contractor informs the Auditor on each occasion when the 'quarterly' check has been carried out, within 7 days of the survey taking place. The Contractor maintains a record of all quarterly checks which must be available for inspection by the Auditor at any time.
- 4.4.3 The Contractor processes the survey data collected from the Primary Reference Site to obtain the parameters given in Table 4.2.1, and reports them to the Auditor within 14 days of the survey, for comparison with the Reference Data Set.
- 4.4.4 The Auditor compares the results of the 'quarterly' survey with the Reference Data Set. If, on comparison, any of the measurements is found to be outside the permitted tolerance levels, the results of any and all SCANNER accredited surveys since the last previous successful survey (i.e. 'monthly' check) of a Principal Reference Site are suspect.
- 4.4.5 The Auditor may carry out an independent survey of the site. The Auditor may require the Contractor to demonstrate the operation of the processing system used to calculate the parameters used in the 'quarterly' check.
- 4.4.6 If the Auditor finds that the failure of the quarterly check is due to a failure in the operation or performance of the Equipment, then the Auditor may define any or all survey data collected since the last previous successful monthly check of a Principal Reference Site as invalid and inform any Employer affected and the Department for Transport accordingly.

4.4.7 The Auditor may also suspend or revoke any current Accreditation Certificate until the acceptable operation and performance of the Equipment to the SCANNER specification has been demonstrated in an Accreditation re-test.

4.5 ***Principal Reference Sites***

4.5.1 In order to set up a Principal Reference Site, the Contractor establishes the performance of the Equipment at the Principal Reference Site following a reference survey at the Primary Reference Site or an existing Principal Reference site.

4.5.2 The Contractor surveys the intended Principal Reference Site with the accredited Equipment within 7 days immediately following the reference survey at the Primary Reference Site or an existing Principal Reference site to provide a reference data set for that Equipment only. The Contractor may carry out more than one survey at each site as a measure of consistency and repeatability of the Equipment at that site.

4.5.3 The Contractor informs the Auditor within 7 days of carrying out the reference survey of each Principal Reference Site it has chosen. The Auditor may carry out an independent survey of any of the Principal Reference Sites at any time.

4.5.4 The Contractor processes the survey data collected from the Principal Reference Site to obtain the parameters given in Table 4.2.1 within 14 days of the reference survey. The Auditor may request to see them at any time thereafter.

4.5.5 The Contractor stores these parameters as a reference data set for future comparison with subsequent re-surveys of the Principal Reference Site. These data sets are the "Reference Data Set" for that Principal Reference Site.

4.6 ***Regular 'monthly' Checks***

4.6.1 In order to maintain control over possible changes in the measurement accuracy of the Equipment the Contractor carries out, at its own cost, regular 'monthly' checks of the survey data from a Principal Reference Site or the Primary Reference Site against the Reference Data Set previously collected on the same site.

4.6.2 The Contractor selects one or more of the Principal Reference Sites at which to carry out each 'monthly' check. At intervals not exceeding one month, the Contractor surveys at least one previously established Principal Reference Site or the Primary Reference Site with the accredited Equipment. The Contractor may

carry out more than one survey on the site as a measure of consistency and repeatability of the Equipment at that site.

- 4.6.3 The Contractor maintains a record of all monthly checks which must be available for inspection by the Auditor at any time.
- 4.6.4 The Contractor processes the survey data collected from the site to obtain the parameters given in Table 4.2.1, within 14 days of the survey, for comparison with the Reference Data Set. The Auditor may request to see them at any time thereafter.
- 4.6.5 The Auditor may compare the results of any 'monthly' survey with the Reference Data Set. If, on comparison, any of the measurements is found to be outside the permitted tolerance levels, the results of any and all SCANNER accredited surveys since the last previous successful survey of a Principal Reference Site or the Primary Reference Site are suspect.
- 4.6.6 The Auditor may carry out an independent survey of the site. The Auditor may require the Contractor to demonstrate the operation of the processing system used to calculate the parameters used in the 'monthly' check.
- 4.6.7 If the Auditor finds that the failure of the monthly check is due to a failure in the operation or performance of the Equipment, then the Auditor may define any or all survey data collected since the last previous successful monthly check of a Principal Reference Site or the Primary Reference Site as invalid, and inform any Employer affected and the Department of Transport accordingly.
- 4.6.8 The Auditor may also suspend or revoke any current Accreditation Certificate until the acceptable operation and performance of the Equipment to the SCANNER specification has been demonstrated in an Accreditation re-test.
- 4.7 ***Secondary Reference Sites***
- 4.7.1 For operational convenience, the Contractor may select one or more Secondary Reference Sites over which to carry out 'weekly' checks. These may be the same sites as used for daily checks.
- 4.7.2 The Contractor processes the survey data collected from the site to obtain the parameters given in Table 4.2.1, within 14 days of the survey, for comparison with

the Reference Data Set. The Auditor may request to see them at any time thereafter.

4.7.3 Any Secondary Reference Site may also be subject to an independent survey by the Auditor. The Auditor may require the Contractor to demonstrate the operation of the processing system used to calculate the parameters used in the 'weekly' checks.

4.8 ***Regular 'weekly' checks***

4.8.1 In order to maintain control over possible changes in the measurement accuracy of the Equipment the Contractor carries out, at its own cost, regular 'weekly' checks of the survey data from any previously established reference test site against the Reference Data previously collected on the same reference test site.

4.8.2 The Contractor selects one or more of the reference test sites at which to carry out each 'weekly' check. At intervals not exceeding 7 days, the Contractor surveys any currently established reference test site with the accredited Equipment. The Contractor may carry out more than one survey on the site as a measure of consistency and repeatability of the Equipment.

4.8.3 The Contractor maintains a record of all weekly checks which must be available for inspection by the Auditor at any time.

4.8.4 The maximum time between weekly checks should be no longer than 7 days during the period that SCANNER accredited surveys are being carried out. If the Contractor designates more than one reference test site for weekly checks the Equipment only needs to be checked at one of the designated sites each week.

4.8.5 To perform a weekly check (on any of the reference test sites, including the Primary Reference Site or any Principal Reference Site) the Contractor carries out a survey of the reference test site and processes the Survey Data, ideally on-board the Equipment, to obtain the parameters given in Table 4.2.1.

4.8.6 The Contractor calculates the differences between the Reference Data for that site and the parameters calculated from the Survey Data obtained during the weekly check of the reference test site. The differences should fall within the tolerances given in Table 4.10.1.

4.8.7 There are special requirements for Weekly Checks on the identification of cracking. These requirements are described in Section 4.10.

- 4.8.8 If the measurement of any parameter exceeds the tolerance level given in Table 4.10.1 the weekly check test run is repeated. If, after three repeat runs, the measurement of any parameter still exceeds the tolerance level, the Contractor informs the Auditor and investigates the source of the difference. The Contractor may not carry out any further accredited SCANNER surveys on any Employer's network until the source of the difference has been identified and any deficiencies in the operation or performance of the Equipment have been rectified. Satisfactory rectification of any deficiency is demonstrated by a successful check survey on the Primary Reference Site or a Principal Reference Site in which the measured parameters are all within permitted tolerance limits.
- 4.8.9 If the failure of the weekly check is due to a failure in the operation or performance of the Equipment, then the Auditor may define any or all survey data collected since the last previous successful weekly check as invalid, and inform any Employer affected and the Department of Transport accordingly.
- 4.8.10 The Auditor may also suspend or revoke any current Accreditation Certificate until the acceptable operation and performance of the Equipment to the SCANNER specification has been demonstrated in an Accreditation re-test.
- 4.8.11 If the Contractor makes any alterations to any part of the Equipment or carries out any routine maintenance on the Equipment that might affect the performance of SCANNER accredited surveys, the Contractor carries out a weekly or monthly check on the Primary Reference Site or a Principal Reference Site, which must be completed successfully before the Equipment recommences SCANNER accredited surveys.
- 4.8.12 The Contractor maintains a record of all alterations and routine maintenance activity carried out on each item of accredited Equipment which must be available for inspection by the Auditor at any time.
- 4.9 ***Daily Checks***
- 4.9.1 In order to maintain control over possible changes in the measurement accuracy of the Equipment the Contractor carries out, at its own cost, routine 'daily' checks of the operational capability of the Equipment.
- 4.9.2 The Contractor selects select a suitable test site, which could be close to the depot used for the overnight storage of the accredited Equipment, for carrying out daily checks on the accredited Equipment both before starting each survey shift and

when returning after carrying out a SCANNER accredited survey. The Contractor surveys the same site in the same direction both at the start and the end of each survey shift.

- 4.9.3 The test site used for a daily check may be the same as that used as a reference test site for a weekly check, in which case the Contractor may alternatively follow the procedures for the weekly check.
- 4.9.4 The daily check test site should have a length of at least 400m and should not have any sharp bends or extremes of profile unevenness, texture or rutting. There should be no obstructions or traffic restrictions on the test site.
- 4.9.5 The Contractor carries out a survey of the daily check test site at the start of the survey shift, obtaining all of the Survey Data defined in Table 4.2.1. The Contractor processes the Survey Data collected by the Equipment using a suitable processing system to obtain the parameters given in Table 4.2.1. These reference data are termed the Daily Check Reference Data. A new set of Daily Check Reference Data is generated by each survey shift, each set only being used only for the survey shift for which it is collected.
- 4.9.6 At the end of the survey shift the Contractor carries out an identical measurement to that carried out at the start of the shift over the same daily check test site. The Contractor processes the Survey Data collected by the Equipment using a suitable processing system to obtain the parameters given in Table 4.2.1.
- 4.9.7 The Contractor compares the Survey Data collected from the second test site survey with the Daily Check Reference Data. The differences between the Daily Check Reference Data and the data from the second survey should fall within the tolerances given in Table 4.10.1.
- 4.9.8 There are special requirements for daily checks on the identification of cracking. These requirements are described in Section 4.10.
- 4.9.9 If the Contractor finds any measured parameter to be outside the permitted tolerance then the Contractor repeats the test run with the same Equipment. If any measured parameter still exceeds the tolerance level, any and all survey data collected during the survey shift over which the inconsistency occurred is suspect.

4.9.10 The Contractor investigates the source of the discrepancy and may not carry out any further SCANNER accredited survey runs until the source of the discrepancy has been identified and rectified. Satisfactory rectification of any discrepancy is demonstrated by a successful weekly check survey on a previously established reference test site in which the measured parameters are all within permitted tolerance limits.

4.9.11 If a change in weather conditions makes it impractical or impossible to carry out the daily check survey at the end of a shift, this should be recorded, and the daily check survey carried out on the same site, or another daily test site used within the past week, or a Reference Site, the following day (or as soon as weather conditions improve). If the Equipment is moved away from the area for any reason – for example to 'chase' better weather conditions, the Contractor carries out a 'weekly' test survey at a Reference Site, if possible, before re-commencing surveying. If it is impossible to find a suitable Reference Site, the Contractor establishes a new Reference Site immediately.

4.9.12 The Contractor maintains records of all daily checks which must be available for inspection by the Auditor at any time.

4.10 ***Weekly and Daily Checks on the Measurement of Cracking***

4.10.1 The application of checks on the measurement of cracking intensity based on statistical differences between survey runs is not straightforward on the test sites that are used for the daily and weekly checks. This arises from the nature of typical crack identification systems in missing some cracks and identifying and reporting small numbers of false cracks. Therefore, over a test site that has a relatively short length and a low number of cracks, such as might be selected for a daily check test or as a weekly reference site, missing one or two existing cracks or identifying one or two false cracks, will significantly affect the statistical performance of the system.

4.10.2 The Contractor is therefore responsible for putting a procedure in place that ensures that daily and weekly checks are carried out on the crack identification system of the accredited Equipment. This procedure should include:

- Checks on the lighting system to ensure that the lighting levels and evenness fall within the tolerances defined as “acceptable” for the accredited Equipment by the Contractor. The Contractor provides a definition of the “acceptable tolerances” for the lighting levels and evenness of lighting.

- Checks on the image collection equipment to ensure that the images meet the requirements defined as “acceptable” for the accredited Equipment by the Contractor. The Contractor provides a method for the operator to visually compare images collected during the daily or weekly checks with the reference images collected during daily checks, weekly or monthly reference surveys. The Contractor provides a definition of “acceptable requirements” for the quality of the images collected by the accredited Equipment.
- Checks on the crack identification software to ensure it is operating effectively. The Contractor provides a method for the operator to visually compare the results of the crack identification carried out on images collected during daily or weekly checks with the results of crack identification carried out on reference images collected during the daily checks, weekly or monthly reference surveys

4.10.3

The Auditor investigates and approves the Contractor's procedure as part of the Acceptance Testing and subsequent re-testing before it is used as a method of carrying out monthly, weekly or daily checks on the Equipment.

Measured Parameter	Tolerance - Quarterly and Monthly Checks (95% Limits ¹)	Tolerance - Weekly Checks (85% Limits ²)	Tolerance - Daily Checks (65% Limits ³)	Tolerance - Repeat Surveys (65% Limits ⁴)	Tolerance - All Test Surveys (Maximum)
Location Referencing ⁵ - Length of Surveyed Site	±2 m or ±0.1% ⁸	±2 m or ±0.1% ⁸	±2 m or ±0.1% ⁸	±5m or ±0.1% ⁸	±50m or ±10% ¹⁰
Location Referencing ⁴ - National Grid Co-ordinate of Section Start Point	±2 m	±2 m	±5 m	±5 m	±50 m
Location Referencing - National Grid Co-ordinate	±2 m	±2 m	±7 m	±7 m	±50 m
Alignment - Gradient	± 1.50 or ±10% ⁸	± 1.50 or ±10% ⁸	± 1.50 or ±10% ⁸	± 1.50 or ±10% ⁸	± 6
Alignment - Crossfall	± 1.50 or ±10% ⁸	± 1.50 or ±10% ⁸	± 1.50 or ±10% ⁸	± 1.50 or ±10% ⁸	± 6
Alignment - Radius of Curvature	±50m or 25% ⁸	±50m or 25% ⁸	±50m or 25% ⁸	±50m or 25% ⁸	2xReference Radius of Curvature or ±100m ⁸
Longitudinal Profile ⁶ - 3 m Variance	± 0.60	± 0.60	± 0.60	± 0.60	N/A
Longitudinal Profile ⁶ - 10 m Variance	± 0.70	± 0.70	± 0.70	± 0.70	N/A
Longitudinal Profile ⁶ - 30 m Variance	± 0.90	± 0.90	± 0.90	± 0.90	N/A
Transverse Profile - Individual Rut Depths ⁷	± 3.0 mm	± 3.0 mm	± 3.0 mm	± 3.0 mm	50% of Reference Rut Depth or 10mm ⁸
Texture Profile - SMTD	± 0.25 mm	± 0.25 mm	± 0.25 mm	± 0.25 mm	± 0.75 mm
Cracking ⁹ - Area of Cracking	See Section 4.10	See Section 4.10	See Section 4.10	See Section 4.10	See Section 4.10

Table 4.10.1. Acceptable tolerances for Weekly and Daily Checks and Repeat Surveys

Notes for Table 4.10.1:

- (1) For Quarterly and Monthly Checks 95% of the differences should fall within the range of tolerances specified. The data should be expressed as averages, or at intervals of (as appropriate), 10m.
- (2) For Weekly Checks 85% of the differences should fall within the range of tolerances specified. The data should be expressed as averages, or at intervals of (as appropriate), 10m.
- (3) For Daily Checks 65% of the differences should fall within the range of tolerances specified. The data should be expressed as averages, or at intervals of (as appropriate), 10m.
- (4) For Repeat Surveys 65% of the differences should fall within the range of tolerances specified. The assessment of the data will be carried out by the Auditor over lengths of 50m.
- (5) The comparison of Site Length and the location of the section start point is absolute. All measurements of distance travelled and the location of the section start point must fall within the specified tolerance of the reference distance travelled.
- (6) For 3 m, 10 m and 30 m Moving Average Longitudinal Profile Variance the tolerances are in terms of the fractional errors between the Moving Average Longitudinal Profile Variances calculated from the measured profile and the moving average Longitudinal Profile variances calculated from the Reference Profile.
- (7) Both Nearside and Offside Rut Depths should fall within the tolerance specified.
- (8) Whichever is the larger.
- (9) For Repeat Surveys the tolerance in the detection of cracking is the minimum percentage of 50m lengths shown by the original survey to contain high or low levels of cracking that are also shown to contain high or low levels of cracking in the repeat survey, assessed as defined in Section Volume 3.
- (10) Whichever is the smaller

5 Contractor's Progress Reports

5.1 *General Requirements*

- 5.1.1 The purpose of a Contractor's progress report is to enable the Auditor to monitor the operation and performance of each Contractor carrying out SCANNER accredited surveys on the English local road network and (if required) to inform an Employer about the plans and progress of the SCANNER accredited surveys on its network.
- 5.1.2 Each Contractor informs the Auditor of each SCANNER accredited survey that it has contracted to undertake for any English local highway authority as soon as possible after the award of contract, with an indication of the anticipated programme and timing for carrying out the surveys.
- 5.1.3 The Contractor informs the Employer when surveying has started on the Employer's road network and when it has been completed
- 5.1.4 The Contractor reports to the Auditor on the locations that have been surveyed on each Employer's network within 14 days of carrying out the SCANNER accredited surveys.
- 5.1.5 The Contractor reports to the Auditor on the locations for which the SCANNER accredited survey results have been delivered to the Employer within 14 days of the Employer receiving the results.
- 5.1.6 The Contractor informs the Auditor of the location of reference sites it has chosen, both Primary and Principal Reference Sites and, if specifically requested by the Auditor, Secondary Reference Sites, and reports when it uses Primary sites for 'quarterly' checks.
- 5.1.7 The Contractor informs the Auditor of the outcome of all 'quarterly', and 'monthly' checks and, if requested by the Auditor, provides the results of any of them to the Auditor for independent checking.
- 5.1.8 The Contractor informs the Auditor as soon as practicable of any accident or incident involving the SCANNER accredited Equipment that might affect the performance of SCANNER accredited surveys.

5.1.9

The Contractor informs the Auditor as soon as practicable of any alterations to any part of the Equipment or any routine maintenance on the Equipment that might affect the performance of SCANNER accredited surveys.

6 Repeat Surveys

6.1 *General Requirements*

6.1.1 The purpose of Contractor's Repeat Surveys is to demonstrate the *repeatability* of SCANNER surveys, the continuing reliable operation of the Equipment and performance of the Surveys and the consistency of results obtained by each Contractor.

6.1.2 The Contractor's Repeat Surveys are carried out by the Contractor at the Contractor's expense.

6.1.3 Each Contractor informs the Auditor of each SCANNER accredited survey that it has contracted to undertake for an English local highway authority as soon as possible after the award of contract, with an indication of the anticipated programme and timing for carrying out the surveys.

6.1.4 The Auditor informs the Contractor as soon as practicable of the requirements for Contractor's Repeat Surveys, so that they are a small but statistically meaningful sample of that Contractor's programme, are reasonably spread across different regions, different types of local authority and different road conditions and are reasonably spread through the survey year.

- As a percentage of the length of surveys to be carried out,
- taking account of the range of local highway authorities and road conditions over which SCANNER accredited surveys are to be provided, and
- taking account of the Contractor's indicative programme.

6.1.5 The minimum requirements for SCANNER accredited surveys are:

- Ten Contractor's Repeat Surveys within the survey year
- Carried out at approximately monthly intervals
- Each with a individual length of no more than 10km

6.1.6 The Auditor identifies a number of lengths for Contractor's Repeat Surveys from the list of contracts that have been awarded, informs the Contractor of the sites for Contractor's Repeat Surveys and invites the Contractor to select the specific lengths from among them over which Contractor's Repeat surveys are carried out.

- 6.1.7 The Auditor may also, at its discretion, request the Contractor to carry out Contractor's Repeat Surveys of any parts of an Employer's network which the Contractor surveys.
- 6.1.8 Normally the Contractor and the Auditor will agree which sites are selected for Contractor's Repeat Surveys before the Contractor commences the surveys on an Employer's network. The Contractor carries out the repeat survey within 14 days of the initial survey or the request being made by the Auditor.
- 6.1.9 The Contractor provides the SCANNER HMDIF from both the initial survey and the Contractor's Repeat Survey within 21 days of the repeat survey or the Auditor's request for a Contractor's Repeat Survey.
- 6.1.10 The Auditor compares the SCANNER HMDIF from the repeat survey with the SCANNER HMDIF provided by the Contractor for the original survey. The differences between the data obtained from the repeat survey and the original survey must fall within the tolerances for Contractor's Repeat Surveys given in Table 4.10.1
- 6.1.11 The Auditor may invite the Contractor to explain if any differences between the data obtained from the repeat survey and the data collected from the original survey fail to meet the tolerance requirements for Repeat Surveys given in Table 4.10.1. The Auditor decides whether or not to accept the Contractor's explanation, and whether the Equipment still meets the requirements for SCANNER accredited surveys.
- 6.1.12 If the Auditor does not accept the explanation the Auditor may require the Contractor to re-survey that test site to confirm the results of the Contractor's Repeat Survey. The Auditor may also require the Contractor to carry out additional Contractor's Repeat Surveys on a small but representative sample of any Employer's network that was being surveyed within one month of the problematic survey, at the Contractor's cost, to demonstrate the consistency and reliability of those surveys.
- 6.1.13 If these additional Contractor's Repeat Surveys demonstrate a wider problem with either the operation or performance of the Equipment, the Auditor may suspend or revoke any current Accreditation Certificate until the acceptable operation and performance of the Equipment has been demonstrated in an Accreditation re-test.

7

Auditor's Repeat Surveys

7.1

General Requirements

7.1.1

The purpose of Auditor's Repeat Surveys is to demonstrate independently the continuing reliability of the operation and performance of SCANNER accredited surveys by each Contractor, with each item of Equipment, and the consistency and reliability of the survey data obtained.

7.1.2

The Auditor selects suitable sites for Auditor's Repeat Surveys. The Auditor performs these surveys with a survey vehicle selected by the Auditor, which has been assessed against the requirements of the SCANNER specification for accuracy.

7.1.3

The Auditor may carry out Auditor's Repeat Surveys over any length of an Employer's Network.

7.1.4

The Auditor uses the Contractor's progress reports to select the sites over which Auditor's Repeat Surveys will be performed. The Auditor informs the Contractor of the sites over which the Auditor's Repeat Surveys are to be carried out within 7 days of the Auditor receiving the Contractor's relevant progress report.

7.1.5

The Auditor carries out any Auditor's Repeat Surveys within 14 days of receiving the Contractor's relevant progress report.

7.1.6

The Contractor provides the data from the sites selected for the Auditor's Repeat Surveys within 14 days of the Auditor notifying the Contractor of the sites selected for Auditor's Repeat Surveys.

7.1.7

The Contractor provides the Auditor with the Survey Data recorded by the Contractor over each site selected for Auditor's Repeat Surveys as SCANNER HMDIF.

7.1.8

The Auditor compares this SCANNER HMDIF with the SCANNER HMDIF produced from the Survey Data obtained by the Auditor over the same site. The differences between the parameters in the Contractor's SCANNER HMDIF and the Auditor's SCANNER HMDIF must fall within the tolerances for Repeat Surveys given in Table 4.10.1

- 7.1.9* The Auditor may invite the Contractor to explain if any differences between the data obtained from the Auditor's repeat survey and the data collected from the Contractor's original survey fail to meet the tolerance requirements for Repeat Surveys given in Table 4.10.1. The Auditor decides whether to accept the Contractor's explanation or not, and whether to accept that the Equipment still meets the requirements for SCANNER accredited surveys.
- 7.1.10* If the Auditor does not accept the explanation the Auditor may require the Contractor to re-survey that test site to confirm the results of the original survey. The Auditor may also require the Contractor to carry out additional Contractor's Repeat Surveys on a small but representative sample of any Employer's network that was being surveyed within one month of the original problematic survey, at the Contractor's cost, to demonstrate the consistency and reliability of those surveys.
- 7.1.11* If these additional Contractor's Repeat Surveys demonstrate a wider problem with either the operation or performance of the accredited Equipment, the Auditor may suspend or revoke any current Accreditation Certificate until the acceptable operation and performance of the Equipment to the SCANNER specification has been demonstrated in an Accreditation re-test.

8 Random Spot Checks

8.1 *General Requirements*

8.1.1 The Contractor may be subject to random spot checks of the operation and performance of SCANNER accredited surveys.

8.1.2 The Auditor may accompany the Contractor on randomly selected surveys to ensure that the Surveys are being carried out in an acceptable manner and to an appropriate standard, and in particular that the Contractor is complying with its quality assurance procedures and the requirements of the SCANNER specification.

8.1.3 The Auditor may assess the competence of drivers and operatives carrying out SCANNER accredited surveys at any time. The Auditor reports any concerns about competence to the Contractor and may also report them to any Employer affected and to the Department for Transport.

8.1.4 If the Auditor considers a lack of driver or operator competence may affect the ability of the Contractor to perform effective SCANNER accredited surveys, the Auditor may suspend or revoke any current Accreditation Certificate until competence to operate the Equipment has been demonstrated by an Accreditation re-test, carried out by the drivers and/or operatives whose competence is in doubt.

9

Checks on SCANNER RCD

9.1

General Requirements

9.1.1

On English local highway authority road networks Contractors are not expected to deliver SCANNER RCD as part of routine SCANNER accredited surveys. However, the Auditor may, at its discretion, request the Contractor to deliver SCANNER RCD from one of the routes surveyed by the Contractor for any Employer. The purpose of this requirement is to enable detailed checks on the performance of the Contractor's processing system to produce HMDIF output.. Normally the Auditor will only request the Contractor to deliver SCANNER RCD from one Employers' network each year, unless there are concerns that need to be investigated.

9.1.2

The Auditor may require the Contractor to provide both SCANNER RCD and SCANNER HMDIF from up to 5% of any Employer's network or 10 km (whichever is the smaller) for checking. The Contractor provides the data required by the Auditor for the checks on SCANNER RCD at their own expense.

9.1.3

The Auditor selects the routes for delivery of SCANNER RCD from the routes provided to the Employer by the Contractor before commencing the surveys, and notifies the Contractor of these selected survey routes before the Contractor carries out SCANNER accredited surveys on the routes using the accredited Equipment.

9.1.4

The Auditor uses the Machine Survey Pre-processor (MSP) to produce the SCANNER HMDIF from the SCANNER RCD provided by the Contractor for the selected survey routes and compares the MSP HMDIF with the SCANNER HMDIF provided by the Contractor from the same survey routes to check that the Contractor has calculated the SCANNER HMDIF correctly.

9.1.5

The Auditor may invite the Contractor to explain the reasons for any differences between the SCANNER HMDIF calculated using the MSP from the SCANNER RCD and the SCANNER HMDIF provided by the Contractor. The Auditor decides whether to accept the Contractor's explanation or not, and whether to accept that the Equipment still meets the requirements for SCANNER accredited surveys

- 9.1.6 If the Auditor does not accept the explanation the Auditor may require the Contractor to reprocess the SCANNER RCD to confirm the results of the original processing
- 9.1.7 If this additional processing demonstrates a wider problem with either the operation or performance of the accredited Equipment, the Auditor may suspend or revoke any current Accreditation Certificate until the acceptable operation and performance of the Equipment to the SCANNER specification has been demonstrated in an Accreditation re-test.

10

Annex A: - National Accreditation, QA and Audit Testing Contract

10.1

Objective of Contract

10.1.1

The objective of this contract is to provide:

- (a) Acceptance testing services for any new machines, submitted to carry out SCANNER accredited surveys on English local roads, to the specification current at the time of testing, leading to accreditation;
- (b) An annual accreditation retesting service for all machines, currently accepted to carry out SCANNER accredited surveys on English local roads, to the specification current at the time of testing, leading to accreditation;
- (c) SCANNER accreditation certificates for survey machines, that meet the criteria in the acceptance tests and the annual accreditation retests;
- (d) Quality Assurance testing services for any SCANNER accredited survey machines that are used on the English local road network and
- (e) Audit services on a representative sample basis for any SCANNER accredited survey machines that are used on the English local road network.

10.2

Services and Deliverables

10.2.1

Acceptance Testing.

10.2.2

Machine developers or survey operators may submit survey vehicles for acceptance testing from time to time. For each survey vehicle, driver or operative submitted, the acceptance tester shall:

- (a) agree an acceptance testing programme, including the acceptance criteria, in writing with the machine developer or survey operator, for any survey machine, accepted for testing;
- (b) test the performance of any survey machine, accepted for testing against the criteria and the requirements defined in the SCANNER specification current at the time of testing on selected test sites;
- (c) test the performance of the survey machine, against the criteria and the requirements defined in the SCANNER specification current at the time

of testing under conditions typical of those found on a network survey of local roads in England; and

- (d) produce an acceptance report and issue an acceptance certificate and a SCANNER accreditation certificate as defined in the SCANNER specification current at the time of testing for any survey machine, that meets the acceptance criteria.

10.2.3 Annual re-testing.

10.2.4 Machine developers or survey operators may submit survey machines that have valid acceptance or accreditation certificates for annual SCANNER accreditation re-testing. Each year the acceptance tester shall:

- (a) develop an accreditation testing programme, including accreditation criteria, for all the survey machines, currently accepted for SCANNER surveys and agree it with the survey operators;
- (b) test the performance of all survey machines accepted for testing against the criteria and the requirements defined in the SCANNER specification current at the time of testing on selected test sites;
- (c) test the performance of all survey machines accepted for testing against the criteria and the requirements defined in the SCANNER specification current at the time of testing under conditions typical of those found on a network survey of local roads in England;
- (d) produce an accreditation report and issue a SCANNER accreditation certificate as defined in the SCANNER specification current at the time of testing for all survey machines, that meet the accreditation criteria; and
- (e) if requested, provide an acceptance testing service for any survey machine, that fails the accreditation retests.

10.2.5 Quality Assurance

10.2.6 For each and every English local highway authority commissioning SCANNER surveys, the quality assurance provider shall assume the role of auditor as defined in the SCANNER specification current at the time and provide advice and guidance if requested.

10.2.7 Where necessary, the auditor role may require the provider to act as an arbiter in the event of dispute or disagreements between a local authority and the survey operator.

- 10.2.8* For each SCANNER accredited survey vehicle undertaking SCANNER surveys on the English local road network during the contract period, the auditor shall, in accordance with the SCANNER specification current at the time:
- (a) review and assess the weekly and daily checks implemented by each survey operator and maintain contact with each operator to ensure continuity of the quality assurance procedures;
 - (b) review each survey operator's weekly progress reports, select sites for the SCANNER survey operator's repeat surveys, compare and assess the data from the repeat survey sites against the requirements of the SCANNER specification current at the time;
 - (c) liaise with each local highway authority as appropriate to resolve any issues arising from the survey operator's quality assurance procedures.
- 10.2.9* Audit of Vehicle Operation
- 10.2.10* For each SCANNER accredited survey vehicle undertaking SCANNER surveys on the English local road network during the contract period, the auditor shall, in accordance with the SCANNER specification current at the time:
- (a) review the survey operator's weekly progress reports and select sites for the auditor's repeat surveys;
 - (b) undertake auditor's repeat surveys using a suitable survey vehicle;
 - (c) obtain data from the survey operator and assess the data from the repeat survey sites against the requirements of the SCANNER specification current at the time;
 - (d) liaise with each local highway authority as appropriate to resolve any issues arising from the auditor's quality assurance procedures.
- 10.2.11* SCANNER Advice and Consultancy
- 10.2.12* The contractor shall provide advice and consultancy services concerning any matters of acceptance, accreditation and quality assurance testing and audit requirements to the Department, English local highway authorities, survey operators and machine developers and other parties if required.
- 10.2.13* In particular the contractor will be expected to brief the UK Roads Board by correspondence, the SCANNER Implementation Advisory Group (both at meetings and by correspondence) and the SCANNER Project Management Group

(normally by correspondence) on the progress of acceptance testing, accreditation testing, audit and quality assurance testing and any issues of concern.

10.3

Timescale

10.3.1

This contract will start on 31st March 2005 and will run until 30th September 2007. Acceptance testing and Accreditation testing services are commence 31st March 2005 and to continue until at least 30th March 2007. Quality Assurance and Audit services are to commence 1st April 2005 and to continue until at least 30th September 2007.

10.3.2

The contract may be extended to provide similar services to the Welsh Assembly Government and to local authorities in Wales, on similar terms as for the Department for Transport and local authorities in England.

10.3.3

The contract may be extended on an annual basis for up to three further years, until 30th September 2010.

10.3.4

If the contract is extended beyond September 2007, it may also be extended to include the requirements for acceptance and accreditation testing for the SRMCS and to provide QA testing and audit services to support the SRMCS.

10.4

Outputs from the contract

10.4.1

The outputs from the project will be:

- (a) brief written progress reports at monthly intervals to the Department for Transport, highlighting any issues that require attention or resolution;
- (b) brief written rejection reports for each survey machine that fails any stage of acceptance testing, issued to the machine developer or survey operator, summarising the reasons for failure and what remains to be done to reach acceptance;
- (c) acceptance reports and acceptance certificates issued to the machine developer or survey operator and to the Department for Transport on successful validation of each survey machine submitted for acceptance testing;
- (d) accreditation certificates or written rejection reports issued to the survey operator and to the Department for Transport on the outcome of accreditation retesting;
- (e) a summary report on each annual accreditation testing programme issued to all SCANNER accredited survey operators and the Department for

Transport, highlighting any general issues that require attention or resolution;

- (f) a detailed performance report on each survey machine entered for the annual accreditation testing programme, issued to the survey operator, highlighting any specific issues that require attention or resolution;
- (g) a brief written report to the Department for Transport on any individual case where the auditor is required to act as arbiter, highlighting any general issues that require attention or resolution;
- (h) brief written monthly reports on the progress of quality assurance, issued to the Department for Transport and each SCANNER accredited survey operator;
- (i) an annual summary report on the process and progress of acceptance testing, accreditation testing, quality assurance testing and the provision of audit services, in a form suitable to be published on paper and electronically over the internet, highlighting any issues for attention or resolution, and including in particular:
 - (1) the performance of survey machines, drivers and operatives submitted for acceptance testing and the number of acceptance certificates issued;
 - (2) the performance of survey machines, drivers and operatives submitted for accreditation testing and the results of the accreditation trials
 - (3) a summary description of the quality assurance and audit surveys actually carried out and the results;
 - (4) the numbers and names of English local highway authorities for which advice and guidance was provided;
- (j) a brief summary of any advice and guidance provided under this contract;
- (k) any remaining issues that still require attention, with recommendations on how they might be addressed and resolved;

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