HAPMS

TRACS Data Specification

Document 037

Version 07.01

Released 01 May 2012

Commercial in Confidence

Document Control Information

TRACS Data Specification

Document Number:	037
Version:	07.01
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Status	Final
Release Date:	01 May 2012
Printed Date:	01 May 2012 10:02

Description

This document describes the data to be provided for and by the TRACS data collection contract and the format in which those data are to be supplied.

Version Number	Description
V01.01	First draft.
V01.02	After initial review by Alex Wright & John Pynn (TRL)
V01.03	After further review by project team and TRL
V01.04	First formal release
V01.05	Removal of Surface Type from Route File. Removal of GPS Co-ordinates from Location Marker records in TRACS data.
V01.06	Change to record termination character(s)
V01.07	Addition of Section Function to Route File Typographical error in Record S1.3 and S3.1
V01.08	Combination of speed and longitudinal profile data Increase in precision of texture point spacing from 3 to 9 decimal places
V01.09	Increase in precision of spacing of geometric measurements, longitudinal profile and transverse profile from 3 to 9 decimal places. Removal of "GPS" from references to co-ordinates. Removal of "optional" flag on Geometric data.
V01.10	Addition of Deviation flag to Geometric record
V02.01	Addition of Luminescence to Geometric record
V03.01	Addition of Surface Type to Geometric record "Crack detection system not operational" indicated by -1 cracks
V04.01	Removal of Surface Type from Geometric Record (in line with MSP Version 8)
V05.01	Addition of Retro-reflectivity data (in line with MSP Version 9)
V06.01	Modification of Retro-reflectivity data accommodating Transverse Retro-reflectivity Profiles (in line with MSP Version 10)
V07.01	Changes in format for TRACS3: Additional survey description records; Road Marking Profile; NS and OS longitudinal profile; Multiple line texture; Surface Deterioration.

Contents

1 Introduction

The purpose of the document is to provide a formal specification of the data to be provided by the TRACS data collection contract.

Section 2 describes the physical structure of the route file which may be read prior to carrying out a survey.

Section 3 describes the data to be provided by the TRACS survey.

Section 4 describes the physical structure of the TRACS output file.

Section 5 suggests physical data transfer media.

In 2007, measurement of retro-reflectivity was added to the TRACS data. It is possible that, in later years, retro-reflectivity measurements may be made at the same time, and by the same vehicle, as other data, e.g. longitudinal profile. However initially, retro-reflectivity data will be collected by a separate survey. This specification applies to both separate and combined surveys.

2 Route File Specification

2.1 Introduction

The definition of a survey route shall be provided in a single file, logically divided into four sections:

- Route "header" data;
- Survey lanes comprising the route;
- "End of Route" Reference;
- Sections referred to within the survey lanes.

The file shall consist of sequential records, each containing printable ASCII characters terminated by ASCII "Carriage Return" and "Line Feed" characters. (See Appendix A for a formal definition.)

The file shall contain:

> One record of type R1.1, followed by
> one or more records of type R2.1, followed by
> one record of type R3.1, followed by
> none, one or more records of type R4.1.

as defined in the following sections.

The following generic conventions are used within the "Format" column:

> "A*n*" indicates a text field of *n* characters, left justified and padded with spaces;

> "I*n*" indicates an integer numeric field of up to *n* characters, including an optional leading sign (+ or -), right justified and padded with spaces;

> "F*n.d*" indicates a real number field of up to *n* characters, including the decimal point and an optional leading sign (+ or -), with *d* digits after the decimal point, right justified and padded with spaces;

> (See Appendix A for a formal definition of the various formats.)

2.2 Route "header" data

Record R1.1 (Single record)

Characters	Description	Format	Value range
1-5	'ROUTE'	A5	
6-13	File format version	A8	
14-63	Route identifier	A50	
64-68	Number of survey lanes within the route	I5	1-99999

2.3 Survey Lanes

Record R2.1 (Repeated for each survey lane as defined in record R1.1, sorted in sequence through the route)

Characters	Description	Format	Value range
1-30	Section label (blank for a "dummy" survey lane – see note 1 below)	A30	
31-32	Lane direction indicator, i.e. direction of normal traffic flow on the lane (see note 2 below)	A2	"NB", "SB", "EB", "WB", "CW", "AC"
33-52	Lane name	A20	
53-63	Start chainage (within section), measured in metres	F11.3	0.000 to 9999999.999
64-74	End chainage (within section), measured in metres	F11.3	0.000 to 9999999.999
75-94	Start reference (marker) label	A20	
95-105	Start reference x co-ordinate (if known)	F11.3	0.000 to 9999999.999
106-116	Start reference y co-ordinate (if known)	F11.3	0.000 to 9999999.999

Notes: 1. A "dummy" survey lane requires only a start reference (marker) label. Other data items may be provided (if known) or may be blank / zero as appropriate.

2. Lane direction indicator will be the same as, or opposite to, the section referencing direction indicator defined in the corresponding section record (see 2.5 below). Opposite pairs are: NB/SB, EB/WB, CW/AC.

2.4 "End of Route" Reference

Record R3.1 (Single record)

Characters	Description	Format	Value range
1-20	End reference (marker) label	A20	
21-31	End reference x co-ordinate (if known)	F11.3	0.000 to 9999999.999
32-42	End reference y co-ordinate (if known)	F11.3	0.000 to 9999999.999

2.5 Sections

Record R4.1 (Repeated for each (non-dummy) section referred to in records R2.1, sorted alphabetically by section label)

Characters	Description	Format	Value range
1-30	Section label	A30	
31-41	Section start date (dd-mmm-yyyy, e.g. "01-apr-1998")	A11	Valid date
42-52	Section end date (dd-mmm-yyyy, e.g. "01-apr-1999")	A11	Valid date or blank if undefined
53-63	Section length, measured in metres	F11.3	0.000 to 9999999.999
64-65	Section referencing direction indicator	A2	"NB", "SB", "EB", "WB", "CW", "AC"
66-69	Section Function	A4	E.g. "MAIN", "SLIP", "RBT"

3 Data to be provided by TRACS

3.1 Survey "header" data

The following "header" data shall be provided for a survey:

- Machine identifier/version,
- Output file format version,
- Date at the start of the survey;
- Time at the start of the survey;
- Date at the end of the survey;
- Time at the end of the survey;
- Survey identifier and other textual information;
- Co-ordinates (x, y and z) at the start of the survey data;
- Chainage at the end of the survey data;
- Co-ordinates (x, y and z) at the end of the survey data;
- Number of location markers identified and recorded;
- Chainage interval between geometric measurements;
- Chainage interval between transverse retro-reflectivity profiles;
- Side(s) of vehicle on which transverse retro-reflectivity profiles were measured (left / right / both / neither);
- Chainage interval between longitudinal profile points (and associated speed);
- Offset of longitudinal profile measurement relative to the centre of the vehicle;
- Chainage interval between transverse profiles;
- Number of points within each transverse profile;
- Offset of each transverse profile point relative to the centre of the vehicle;
- Chainage interval between texture profile points;
- Offset of texture profile measurement relative to the centre of the vehicle;
- Chainage interval between RMST texture profile points;
- Number of points within each RMST texture profile;
- Offset of each RMST texture profile point relative to the centre of the vehicle;
- Length of each surface deterioration grid square;
- Offset of left edge of surface deterioration grid relative to the centre of the vehicle[1];
- Number of surface deterioration grid squares (transversely);
- Width of each surface deterioration grid square;
- Number of surface deterioration grid records;

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[1] Reporting an offset of the left edge of the surface deterioration grid supports a situation where the grid is not centred on the centre of the vehicle.

- Number of cracks identified and recorded.

If the survey includes transverse retro-reflectivity profile data, the following shall also be provided:

- Number of (evenly spaced) points within each transverse retro-reflectivity profile;
- Total width of each transverse retro-reflectivity profile;
- Length over which each transverse retro-reflectivity profile was measured.

N.B.   Longitudinal profile data will be filtered to remove wavelengths above a certain value (initially 100m). All survey data shall start at a distance of at least twice that wavelength before the start of the first survey lane within the route against which the survey is to be fitted, and will end at a distance of at least twice that wavelength beyond the end of the last survey lane within the route. If the data collection method requires a longer run-in and/or run-out (e.g. using the HRM principal for measuring longitudinal profile), the additional data shall not be included within the data file.

3.2   Location data

For each location marker identified during the survey run, the following data shall be provided:

- Marker label;
- Chainage.

3.3   Geometric data

For each interval as defined in the survey "header" data:

- Co-ordinates (x, y and z);
- Gradient;
- Crossfall;
- Radius of curvature;
- Deviation flag;
- Luminescence.

3.4   Transverse retro-reflectivity profile data

For each interval as defined in the survey "header" data:

- n (if measured on one side only) or 2n (if measured on both sides) transverse retro-reflectivity measurements (n as defined in the survey "header" data).

3.5   Longitudinal profile and speed data

For each interval as defined in the survey "header" data:

- Single profile point for each of the Nearside and Offside measurements;
- Average speed of the survey vehicle.

N.B.   Longitudinal profile points shall be filtered to remove wavelengths in excess of 100m.

3.6 Transverse profile data

For each interval as defined in the survey "header" data:

- Set of n transverse profile points and associated road marking profile values (n as defined in the survey "header" data).

3.7 Texture data

For each interval as defined in the survey "header" data:

- Single profile point.

3.8 RMST Texture data

For each interval as defined in the survey "header" data:

- Set of n RMST texture profile points (n as defined in the survey "header" data).

3.9 Surface Deterioration data

For each surface deterioration record the following data shall be provided:

- Chainage at the start of the grid squares;
- Surface deterioration value for grid squares 1 to n transversely (n as defined in the survey "header" data).;
- Reliability of this record.

3.10 Crack data

For each crack identified during the survey run, the following data shall be provided:

- Chainage;
- Offset;
- Length;
- Angle;
- Type code.

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4   Output File Specification

4.1   Introduction

Data shall be provided in a single file, logically divided into ten sections – one for each of the data types described in the previous section of this document:

- Survey "header" data;

- Location data;

- Geometric data;

- Transverse retro-reflectivity profile data;

- Longitudinal profile and speed data;

- Transverse profile data;

- Texture data;

- RMST texture data;

- Surface deterioration data;

- Crack data.

The file shall consist of sequential records, each containing printable ASCII characters terminated by ASCII "Carriage Return" and "Line Feed" characters. (See Appendix A for a formal definition.)

For a survey collecting all condition data, the file shall contain:

> One record of type S1.1, followed by
> one or more records of type S1.2, followed by
> one record of type S1.3, followed by
> one record of type S1.4, followed by
> one record of type S1.5, followed by
> one or more records of type S1.6, followed by
> one or more records of type S1.7, followed by
> none, one or more records of type S2.1, followed by
> one or more records of type S3.1, followed by
> one or more records of type S4.1, followed by
> one or more records of type S5.1, followed by
> one or more records of type S6.1, followed by
> one or more records of type S7.1, followed by
> one or more records of type S8.1, followed by
> none, one or more records of type S9.1, followed by
> none, one or more records of type S10.1.

as defined in the following sections.

For a survey collecting all data other than retro-reflectivity, records of types S1.5 and S4.1 will be omitted.

For a survey collecting retro-reflectivity data only, records of type S1.6, S1.7, S5.1, S6.1, S7.1, S8.1, S9.1 and S10.1 will be omitted. In addition, the values of gradient, crossfall, radius of curvature and luminescence in records of type S3.1 shall all be "out of range" values (as defined in the Machine Survey Pre-processor (MSP) parameter file).

Where a record type has the capacity for more than one value / set of values, all records except the last shall be fully utilised, and unused values within the last record should be set to blank or zero, as

appropriate. E.g. If there are 25 points within each transverse profile, there shall be 3 records of type S1.5 with 10 points defined in the first records, 10 points defined in the second record and 5 points defined in the third record (with the remaining 5 offsets set to zero). Similarly, if the length of survey and spacing of texture data define there to be 50,000,004 texture profile point values recorded, there shall be 2,500,001 texture data records (type S7.1) with the first 2,500,000 records having 20 values in each and the last record having 4 actual values and 16 values of zero.

Within each record type, data shall output be in order of increasing survey chainage.

In the case of transverse profile points (and associated road marking profile values) and RMST texture values, where there is more than one value for each chainage, the data for each survey chainage shall be output in order of increasing offset. E.g. If there are 25 points within each transverse profile, and profiles are measured at 0.1m chainage interval, the first 25 profile point values (in records type S6.1) shall correspond to the 25 offsets (left to right) at survey chainage 0. The next 25 values shall correspond to the 25 offsets (left to right) at survey chainage 0.1m etc.

Similarly in the case of transverse retro-reflectivity profile points, the data for each survey chainage shall be output in order from left to right. E.g. If the data is collected on both sides of the vehicle, there are 12 points within each profile, and profiles are measured at 0.1m chainage interval, the first 12 profile point values (in records type S4.1) shall be from the left profile (measured left to right) at survey chainage 0; the next 12 values shall be from the right profile (measured left to right) at survey chainage 0. The following 24 values shall be from the profiles at survey chainage 0.1m etc.

The following convention is used within the "Format" column:

"An" indicates a text field of n characters, left justified and padded with spaces;

"In" indicates an integer numeric field of up to n characters, including an optional leading sign, right justified and padded with spaces;

"mIn" indicates m consecutive fields of format "In";

"F$n.d$" indicates a real number field of up to n characters, including the decimal point and an optional leading sign, with d digits after the decimal point, right justified and padded with spaces;

"mF$n.d$" indicates m consecutive fields of format "F$n.d$".

(See Appendix A for a formal definition of the various formats.)

4.2 Survey "header" data

Record S1.1 (Single record)

Characters	Description	Format	Value range
1-5	'TRACS' or 'RETRO' (for a retro-reflectivity only survey)	A5	'TRACS' / 'RETRO'
6-13	Machine identifier / version	A8	
14-21	File format version	A8	e.g. 'Ver10.00'
22-32	Date at the start of survey (dd-mmm-yyyy, e.g. "31-dec-1999")	A11	Valid date
33-37	Time at the start of the survey (hh:mm, 24-hour clock, e.g. "09:35")	A5	00:00 to 23:59
38-48	Date at the end of survey (dd-mmm-yyyy, e.g. "31-dec-1999")	A11	Valid date
49-53	Time at the end of the survey (hh:mm, 24-hour clock, e.g. "13:43")	A5	00:00 to 23:59
54-55	Number of S1.2 records	I2	1 to 99

Record S1.2 (Repeated as defined in record S1.1)

Characters	Description	Format	Value range
1-80	First record to contain Survey identifier. Subsequent records may contain any information of use to the survey contractor, e.g. versions of software used to create the data file.	A80	

Record S1.3 (Single record)

Characters	Description	Format	Value range
1-11	x co-ordinate at the start of the survey data, measured in metres	F11.3	0.000 to 9999999.999
12-22	y co-ordinate at the start of the survey data, measured in metres	F11.3	0.000 to 9999999.999
23-31	z co-ordinate at the start of the survey data, measured in metres	F9.3	-9999.999 to +9999.999
32-42	Chainage at the end of the survey data, measured in metres	F11.3	0.000 to 9999999.999
43-53	x co-ordinate at the end of the survey data, measured in metres	F11.3	0.000 to 9999999.999
54-64	y co-ordinate at the end of the survey data, measured in metres	F11.3	0.000 to 9999999.999
65-73	z co-ordinate at the end of the survey data, measured in metres	F9.3	-9999.999 to +9999.999

Record S1.4 (Single record)

Characters	Description	Format	Value range
1-5	Number of location markers identified during the survey run (see note 1 below)	I5	0 to 99999
6-17	Chainage interval between geometric measurements, measured in metres (see note 3 below)	F12.9	0.000000000 to 99.999999999
18-29	Chainage interval between transverse retro-reflectivity profiles, measured in metres (see note 3 below)	F12.9	0.000000000 to 99.999999999
30-30	Side(s) of vehicle on which transverse retro-reflectivity profiles are measured	A1	"L"eft / "R"ight / "B"oth / "N"either
31-42	Chainage interval between longitudinal profile points (and associated speeds), measured in metres (see note 3 below)	F12.9	0.000000000 to 99.999999999
43-48	Offset of Nearside longitudinal profile points, measured in metres from the centre of the survey vehicle, negative to the left (zero if longitudinal profile is not being collected).	F6.3	-9.999 to +9.999
49-54	Offset of Offside longitudinal profile points, measured in metres from the centre of the survey vehicle, negative to the left (zero if longitudinal profile is not being collected).	F6.3	-9.999 to +9.999
55-66	Chainage interval between transverse profiles, measured in metres (see note 3 below).	F12.9	0.000000000 to 99.999999999
67-69	Number of points within each transverse profile (zero if transverse profile data is not being collected).	I3	0 to 999
70-81	Chainage interval between texture profile points, measured in metres (see note 3 below)	F12.9	0.000000000 to 99.999999999
82-87	Offset of texture profile points, measured in metres from the centre of the survey vehicle, negative to the left (zero if texture profile is not being collected).	F6.3	-9.999 to +9.999
88-99	Chainage interval between RMST texture profile points, measured in metres (see note 3 below)	F12.9	0.000000000 to 99.999999999
100-101	Number of points within each RMST texture profile (zero if RMST texture profile data is not being collected)	I2	0 to 99
102-112	Length of surface deterioration grid squares, measured in metres (zero if surface deterioration grid data is not being collected).	F11.3	0.000 to 9999999.999

113-118	Offset of left edge of surface deterioration grid, measured in metres from the centre of the vehicle, negative to the left (zero if surface deterioration grid data is not being collected).	F6.3	-9.999 to +9.999
119-120	Number of surface deterioration grid squares within each surface deterioration record (zero if surface deterioration grid data is not being collected)	I2	0 to 99
121-125	Width of each surface deterioration grid square, measured in metres (zero if surface deterioration grid data is not being collected)	F5.3	0.000 to 9.999
126-132	Number of surface deterioration grid records	I7	0 to 9999999
133-137	Number of cracks identified and recorded during the survey run (see note 2 below)	I5	0 to 99999

Notes 1. Fitting of routine survey data to the network will be by reference to GPS coordinates. It is therefore anticipated that no location markers will be recorded. Location markers will still be required for accreditation and audit surveys.

   2. A value of -1 for the number of cracks implies that the crack detection system was not operational. (A value of zero indicates that the system was operational but that no cracks were found.)

   3. A value of zero for a chainage interval implies that that particular item of data will not be included in the data file. Thus for a survey that does not collect retro-reflectivity data, characters 18-29 will contain zero (0.000000000). For a survey collecting retro-reflectivity data only, characters 31-42, 55-66, 70-81 and 88-99 will all contain zero values as well as a values of -1 for the number of surface deterioration grid records (characters 126-132) and the number of cracks (characters 133-137).

Record S1.5 (Single record. Included only if retro-reflectivity data are collected)

Characters	Description	Format	Value range
1-2	Number of (evenly spaced) points within each transverse retro-reflectivity profile	I2	0 to 99
3-7	Total width of each transverse retro-reflectivity profile, measured in metres.	F5.3	0.000 to 9.999
8-12	Length over which each transverse retro-reflectivity profile was measured, in metres	F5.3	0.000 to 9.999

Record S1.6 (Repeated as necessary to define the number of transverse profile points specified in record S1.4)

Characters	Description	Format	Value range
1-60	Offsets of up to 10 transverse profile points, measured in metres from the centre of the survey vehicle, negative to the left. Offsets to be in order of increasing value.	10F6.3	-9.999 to +9.999

Record S1.7 (Repeated as necessary to define the number of RMST texture profile points specified in record S1.4)

Characters	Description	Format	Value range
1-60	Offsets of up to 10 RMST texture profile points, measured in metres from the centre of the survey vehicle, negative to the left. Offsets to be in order of increasing value.	10F6.3	-9.999 to +9.999

4.3   Location data

Record S2.1 (Repeated for each location marker as defined in record S1.4)

Characters	Description	Format	Value range
1-20	Marker label	A20	
21-31	Chainage, measured in metres	F11.3	0.0 9999999.999

See Note 1 of record S1.4 above.

4.4   Geometric data

Record S3.1 (Repeated as necessary to provide number of measurements as defined by length of survey and spacing of values)

Characters	Description	Format	Value range
1-11	x co-ordinate	F11.3	0.000 to 9999999.999
12-22	y co-ordinate	F11.3	0.000 to 9999999.999
23-31	z co-ordinate	F9.3	-9999.999 to +9999.999
32-36	Gradient, measured as a percentage relative to horizontal, positive implying upwards travelling in the direction of the survey	F5.1	-99.9 to +99.9
37-41	Crossfall, measured as a percentage relative to horizontal, positive implying right higher than left travelling in the direction of the survey	F5.1	-99.9 to +99.9
42-49	Radius of curvature, measured in metres, positive implying a left hand curve travelling in the direction of the survey	F8.2	-9999.99 to +9999.99
50-50	Deviation flag. "D" indicates that the survey deviated from the defined route over part / the whole of the length ending at the chainage of this record	A1	"D" / " "
51-53	Luminescence (greyscale) of the surface, measured in the range 0 (black) to 255 (white)	I3	0 to 255

4.5 Transverse retro-reflectivity profile data

Record S4.1 (Repeated as necessary to provide number of values as defined by length of survey, number of transverse retro-reflectivity profile points, spacing of profiles and number of sides)

Characters	Description	Format	Value range
1-84	Up to 28 retro-reflectivity values, measured in millicandelas per square metre per lux (mcd/m^2/lux).	28I3	0 to 999

4.6 Longitudinal profile and speed data

Record S5.1 (Repeated as necessary to provide number of values as defined by length of survey and spacing of points/speeds (4 pairs of points plus associated speeds per record))

Characters	Description	Format	Value range
1 - 7	Nearside profile point value, measured in 1/10mm	I7	-999999 to +999999
8 - 14	Offside profile point value, measured in 1/10mm	I7	-999999 to +999999
15 - 18	Speed value, measured in cm/sec	I4	0-9999
19 - 36	As Cols 1-18 for next profile points and speed		
37 - 55	As Cols 1-18 for next profile points and speed		
56 - 72	As Cols 1-18 for next profile points and speed		

4.7 Transverse profile data

Record S6.1 (Repeated as necessary to provide number of values as defined by length of survey, number of transverse profile points and spacing of profiles (16 points plus associated road marking values per record)

Characters	Description	Format	Value range
1-5	Profile point values, measured in 1/10mm	I5	-9999 to +9999
6-6	Road marking value associated with the above profile point value	A1	'0' = road marking not present, '1' = road marking present Blank = road markings not measured
7-12	As Cols 1-6 for next profile point and		

	associated road marking value		
13-18	As Cols 1-6 for next profile point and associated road marking value		
19-24	As Cols 1-6 for next profile point and associated road marking value		
25-30	As Cols 1-6 for next profile point and associated road marking value		
31-36	As Cols 1-6 for next profile point and associated road marking value		
37-42	As Cols 1-6 for next profile point and associated road marking value		
43-48	As Cols 1-6 for next profile point and associated road marking value		
49-54	As Cols 1-6 for next profile point and associated road marking value		
55-60	As Cols 1-6 for next profile point and associated road marking value		
61-66	As Cols 1-6 for next profile point and associated road marking value		
67-72	As Cols 1-6 for next profile point and associated road marking value		
73-78	As Cols 1-6 for next profile point and associated road marking value		
79-84	As Cols 1-6 for next profile point and associated road marking value		
85-90	As Cols 1-6 for next profile point and associated road marking value		
91-96	As Cols 1-6 for next profile point and associated road marking value		

4.8   Texture data

Record S7.1 (Repeated as necessary to provide number of values as defined by length of survey and spacing of points)

Characters	Description	Format	Value range
1-80	Up to 20 texture profile point values, measured in 1/10mm	20I4	-999 to +999

4.9 RMST Texture data

Record S8.1 (Repeated as necessary to provide number of values as defined by length of survey, number of RMST Texture profile points and spacing of values)

Characters	Description	Format	Value range
1-80	Up to 16 multiple line texture values (RMST), measured in 1/10mm.	16I5	-9999 to +9999

4.10 Surface Deterioration Grid

Record S9.1 (Repeated as necessary to provide number of records as defined in record S1.4

Characters	Description	Format	Value range
1-11	Chainage at the start of the grid record	F11.3	0.000 to 9999999.999
12-14	Surface deterioration in grid square 1	I3	0 to 100
$3n$+9 – $3n$+11	Surface deterioration in grid square n (see note 1 below).	I3	0 to 100
$3N$+12 – $3N$+12	Surface deterioration grid reliability	I1	0 or 1

Notes: 1. n = 2 through N, where N = Number of surface deterioration grid squares (transversely), as recorded in record S1.4. Total length of record = $3N$+12.

4.11 Crack data

Record S10.1 (Repeated as necessary to provide data for the number of cracks defined in record S1.4 (three cracks per record))

Characters	Description	Format	Value range
1-11	Chainage, measured in metres	F11.3	0.000 to 9999999.999
12-17	Offset, measured in metres from the centre of the survey vehicle, negative to the left.	F6.3	-9.999 to +9.999
18-22	Length, measured in metres	F5.3	0.000 to 9.999
23-25	Angle, measured in degrees from the direction of travel, negative anticlockwise	I3	-90 to +90
26-27	Type code	A2	
28-54	As Cols 1-27 for next crack		
55-81	As Cols 1-27 for next crack		

5 Physical Data Transfer

5.1 Route File

A single survey route of 100km length would typically generate the following data:

Route File Volumetrics

Length of survey (km)   100

| | | | | | * Including 2 bytes for EOL | |
Data type	Interval (m)	Values	Values per record	Records	Bytes per record *	Mb
Route header record R1.1	N/A	N/A	N/A	1	70	0.000
Survey Lanes (R2.1)	500	200	1	200	118	0.024
"End of Route" record (R3.1)	N/A	N/A	N/A	1	44	0.000
Section records (R4.1)	500	200	1	200	71	0.014
		Total records:		401	Mb:	0.038

As can be seen, this is a small volume of data. Transfer of the route file could therefore be carried out via a network connection or E-mail.

5.2 Output File

A single TRACS survey (collection all data except retro-reflectivity and cracking) of 100km length would typically generate the following data:

TRACS Raw Data Volumetrics

Length of survey (km)   100
Number of transverse profile points   200
Number of RMST profile points   7
Number of surface deterioration grid squares (transversely)   20

| | | | Values per | | * Including 2 bytes for EOL | |
Data type	Interval (m)	Values	record	Records	Bytes per record *	Mb
Survey header record S1.1	N/A	N/A	N/A	1	57	0.00
Survey header record S1.2	N/A	N/A	N/A	2	82	0.00
Survey header record S1.3	N/A	N/A	N/A	1	75	0.00
Survey header record S1.4	N/A	N/A	N/A	1	139	0.00
Survey header record S1.6	N/A	200	10	20	62	0.00
Survey header record S1.7	N/A	7	10	1	62	0.00
Geometry (S3.1)	5	20,000	1	20,000	55	1.10
Long. Profile & Speed (S5.1)	0.1	1,000,000	4	250,000	74	18.50
Transverse profile (S6.1)	0.1	200,000,000	16	12,500,000	98	1,225.00
Texture (S7.1)	0.001	100,000,000	20	5,000,000	82	410.00
RMST Profiles (S8.1)	0.1	7,000,000	16	437,500	82	35.88
Surface det. grid (S9.1)	2	50,000	1	50,000	74	3.70
		Total records:		18,257,500	Mb:	1,694.18

As can be seen, this is a significant volume of data. It is also a requirement that the raw data shall be retained for a number of years so that it could be re-processed, should there be new or changed algorithms introduced.

It is therefore suggested that data should be supplied on portable hard disk.

Appendix A – Character Set and Formats

A.1 Character Set

The following ASCII printable characters may be included within TRACS data:

Char	Dec Code	Char	Dec Code	Char	Dec Code	Char	Dec Code	Char	Dec Code	Char	Dec Code
Space	32	0	48	@	64	P	80	`	96	p	112
!	33	1	49	A	65	Q	81	a	97	q	113
"	34	2	50	B	66	R	82	b	98	r	114
#	35	3	51	C	67	S	83	c	99	s	115
$	36	4	52	D	68	T	84	d	100	t	116
%	37	5	53	E	69	U	85	e	101	u	117
&	38	6	54	F	70	V	86	f	102	v	118
'	39	7	55	G	71	W	87	g	103	w	119
(	40	8	56	H	72	X	88	h	104	x	120
)	41	9	57	I	73	Y	89	i	105	y	121
*	42	:	58	J	74	Z	90	j	106	z	122
+	43	;	59	K	75	[	91	k	107	{	123
,	44	<	60	L	76	\	92	l	108	|	124
–	45	=	61	M	77	]	93	m	109	}	125
.	46	>	62	N	78	^	94	n	110	~	126
/	47	?	63	O	79	_	95	o	111		

A.2 "Carriage Return" and "Line Feed" Characters

Each record is terminated by ASCII "carriage return" and "line feed" characters which have decimal codes 13 and 10.

A.3 Formats

This section describes the various formats referred to within this document. In the formal definitions, the following notation and terminology are used:

|	means 'or'
space	means ASCII character code 32
letter	means any alphabetic character (A-Z, a-z)
digit	means 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9
others	means any printable character as defined in section A.1 with the exception of space, letters and digits
$\{a\}^{n,m}$	means a may appear n to m times
$\{a\}^{n}$	means a will appear n times

A.3.1 "A*n*"

"A*n*" means a string of *n* characters without leading spaces, or a string of *n* spaces. More formally:

$$(\{ \text{letter} \mid \text{digit} \mid \text{others} \}^{1} \{ \text{letter} \mid \text{digit} \mid \text{others} \mid \text{space} \}^{n-1}) \mid \{ \text{space} \}^{n}$$

A.3.2 "I*n*"

"I*n*" means an integer numeric field of up to *n* characters, including an optional leading sign, right justified and padded with leading spaces. More formally:

$$\{ \text{space} \}^{0,n-1} \{ - \mid + \}^{0,1} \{ \text{digit} \}^{1,n} \qquad \text{with a total of n characters}$$

N.B. In some instances, where only positive values are permitted, the width of a field may preclude the inclusion of a sign character. This is intentional.

A.3.3 "mI*n*"

"mI*n*" means *m* consecutive fields of format "I*n*". More formally:

$$\{ \text{I}n \}^{m}$$

A.3.4 "F*n.d*"

"F*n.d*" means a real number field of up to *n* characters, including the decimal point and an optional leading sign, with *d* digits after the decimal point, right justified and padded with spaces. More formally:

$$\{ \text{space} \}^{0,n-d-2} \{ - \mid + \}^{0,1} \{ \text{digit} \}^{1,n-d-1} \{ . \}^{1} \{ \text{digit} \}^{d} \qquad \text{with a total of n characters}$$

N.B. In some instances, where only positive values are permitted, the width of a field may preclude the inclusion of a sign character. This is intentional.

A.3.5 "mF*n.d*"

"mF*n.d*" means *m* consecutive fields of format "F*n.d*". More formally:

$$\{ \text{F}n.d \}^{m}$$