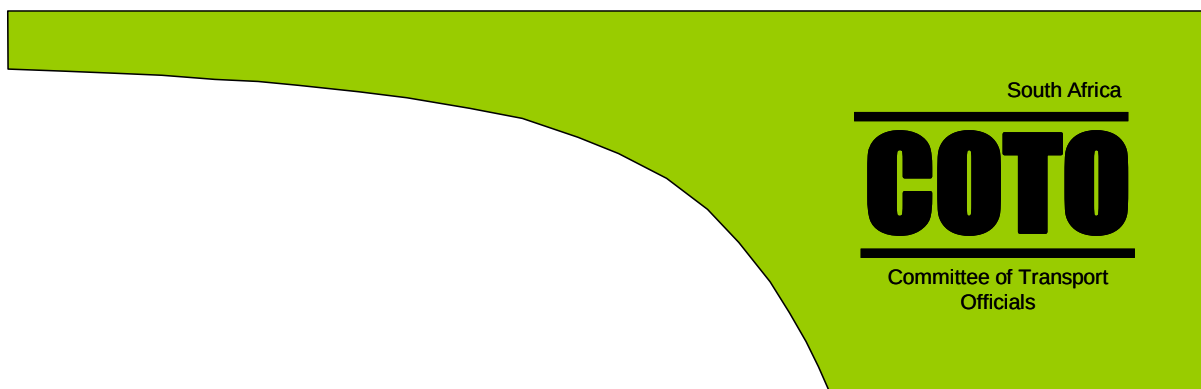




TMH 18

Road Asset Data Electronic Exchange Formats

10/2014

Committee of Transport Officials

TECHNICAL METHODS FOR HIGHWAYS

TMH 18

**Road Asset Data Electronic
Exchange Formats**

10/2014

Draft Version 4

Committee of Transport Officials

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The Technical Methods for Highways consists of a series of publication that is used to either prescribe or to provide guidelines on various aspects related to highway engineering. The documents are primarily aimed at ensuring the use of uniform methods throughout South Africa.

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Synopsis:

Specification for the submission of road network definition and related data

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Executive Summary

This document details the formats for data submission for a national roads database. Data will be compiled into a centralised database, of which the data will be geographically linked and viewable from a centralised data server.

DRAFT

1 Global Format Specifications

The following section defines general data format specifications. These specifications are applied across all data file formats. For detailed specification for each data type, please consult the relevant sections further in this document.

1.1 Data File Format

The file format is based on csv (comma-separated values), however the comma-separator is replaced by a semi-colon character which allows for commas to be used in the data.

All data files must be submitted in plain text using the UTF-8 encoding system. A regular carriage return and line feed will indicate the end of a record, while fields will be delimited by a semi-colon character.

Empty fields are indicated by including only the delimiter character, it is not necessary to include anything else. All fields must be represented within a record or the file will be rejected.

Table 1: General data file format

Formatting	Specification
File Format	UTF8
Record Delimiter	Carriage Return followed by Line Feed
Field Delimiter	Semi Colon
Null Field	No characters followed by field delimiter. Null fields cannot be omitted.
Header	No File Header is required, the file definitions are predefined

1.2 File Naming Convention

The following conventions are used to construct a unique file name per a data file. Each component indicated by the square brackets is defined below.

[AUTHORITY_ID]_[ROAD_ID]_[DATE YYYYMMDDHH24].[DATA EXTENSION]

Example: ECP_P0023_201409301419.fwd

This file would contain FWD data for the Eastern Cape Province, captured on the 30th September 2014 at 2:19 PM.

If the data files are small enough, all data for the province could be combined into 1 file (using [SENDER_ID] only, without specifying the [ROAD_ID]).

See sections that follow for further definitions regarding the components that make up the filename.

1.3 Authority Id

The 'Authority Id' is a unique 3 to 5 character alphanumeric code that uniquely identifies the ownership of the data. Each data authority will be issued with this code before submission can occur, this links all data submitted to that authority and can help prevent issues where data id's are incorrectly used or duplicated across authorities.

Table 2: Authority ID's

Provinces	Metros
ECP: Eastern Cape Province	BUF: Buffalo City Metropolitan Municipality
FSP: Free State Province	CTP: City of Cape Town Metropolitan Municipality
GTP: Gauteng Province	JHB: City of Johannesburg Metropolitan Municipality
KZN: Kwazulu Natal	TSH: City of Tshwane Metropolitan Municipality
LPP: Limpopo Province	EKU: Ekurhuleni Metropolitan Municipality
MPP: Mpumalanga Province	ETH: eThekweni Metropolitan Municipality
NCP: Northern Cape Province	MAN: Mangaung Metropolitan Municipality
NWP: North West Province	NMA: Nelson Mandela Bay Metropolitan Municipality
WCP: Western Cape Province	

1.4 Data Types

Table 3: Date and Time Format Strings

Data Type	Description	Example
Text	Alphanumeric characters are allowed in text fields. The standard UTF8 character set is supported.	R45 Junction 4km east of Malmesbury
Integer	A whole number without fractional values. The length column indicates the maximum size of the number.	Integer(5) 23000
Decimal	A decimal type allows fractional values to be specified. A decimal is described by specifying both a precision and scale. Precision is the maximum number of digits allowed Scale is the maximum number of digits allowed after the decimal point, the fractional value. Precision and scale are specified in brackets after the decimal type name is specified. Precision first and then scale.	Typical KM location field uses Decimal(5,3) Example value: 12.342
Date	Date fields are given as text values with a specific date format string. Please see the next section 1.5 for more details on the date formats specification.	YYYYMMDD HH:MI:SS 20120201 19:32:21

1.5 Date Formats

The date part of the filename refers to the date that the file was generated from the senders system. The year is specified first, followed by month and then day. This order is used as the file can then be sorted chronologically by data generation date, within a file system by sorting on the file name. The HH24 consists of a number from 0 to 23 representing the 24 hours in the day. **Please note that hours, days and months below 10 must be padded with a zero, for example hour 9 would be represented as 09.** The rest of the date characters that makes up the 'Date' part of the filename, refer to their classical representations, year, month and day.

The highest time precision format is seconds however the minimum precision required is hours. Please see specific file formats for the required precision.

Table 4: Date and Time Format Strings

Format Description	Format String	Example
Year	YYYY	2012
Month	MM	02
Day	DD	01
Date Time Separator	[Space]	
Time Separator	:	23:01:23
Hour 24 hour format	HH24	23
Minutes	MI	59
Seconds	SI	59

The full date format is as follows:

Format: YYYYMMDD HH24:MI:SI

Example: 20120201 19:32:21 = 1st February 2012 - 7:32:21 PM

1.6 File Extensions

Each type of data submitted has a dedicated file extension. **Please note that the extensions are case sensitive.**

The file extensions are listed in **Error! Reference source not found.** below.

Table 5: File Extensions

Data Type	File Extension
Road Network Definition	net
Road Geometry Data	kml
Road Geometry Data Compressed	kmz
Road Classification	rcl
Lane Definition	lan
Traffic Link Volume	adt
Visual Condition Flexible Pavement	vcf
Visual Condition Concrete Pavement	vcc
Visual Condition Block Pavement	vcb
Visual Condition Unsurfaced Pavement	vcu
Combined Instrument Data (Riding Quality, Rutting Data, Texture Depth)	cid
Normalised FWD data	fwd
Falling Weight Deflectometer F25	f25

1.7 Base fields required for all data files

The fields indicated below are required for all data types submitted, they help represent a unique location for which the data is associated to.

Table 6: Data file base required fields

Field Name	Data Type	Format	Requirements
Road Id	Character, alphanumeric	Max 20 Chars	Required Foreign key in Network table
Lane Code	Character, alphanumeric	Max 5 Chars	Optional Required should the data represent an individual lane, this is the case for most data sets. Only leave this field empty for data that is not lane specific. See Lane Configuration Details section
Start KM or Survey Point KM	Numeric Decimal(6,3)	Format is 999.999	Required Must refer to km position as measured on the " network " record for this " Road Id " Measured in (km) kilometres
End KM	Numeric Decimal(6,3)	Format is 999.999	Optional if Survey point Must refer to km position as measured on the " network " record for this " Road Id " Measured in (km) kilometres
Date of survey	Date Time	YYYYMMDD HH24:MI	Required

2 Network Definition

2.1 Roads

The network is defined by a series of roads, roads together can form routes. The road establishes the base reference system for all measurements of data. Each road is identified by a unique road_id and this id must be used to reference all related data along with the relevant measure defined in kilometre unit of measure.

How roads are defined should fit in with the existing authority's methodology so that it correlates with field practices and is familiar with the relevant parties who work with the data (for example node-to-node). However the methodology has to follow the following requirements listed below to ensure data integrity.

- Must have a road identifier which is unique across the entire authority's network
- Must be the reference system for all other related data (All data submitted for a road must use the submitted measurements)
- Should the roads geometry change in any way, it is required to resubmit the roads classification file and geometry before submitting newly measured data, failure to do so could result in incorrect data processing
- Must have only a single line string geometry element that represents the road, no compound geometry objects
- Dual carriageways must be represented by two roads, the road naming convention can indicate that the roads are connected, however they are still treated as separate entities
- As this base road's geometry will be used to dynamically segment related data, it is suggested that the logical smaller unit (sub section of a route or

road) will be used to make segmentation more accurate as opposed to a road defining a full route

Example of Road ID's

- D1042_010+
- DR1776_010
- TR03801E

2.2 Network Definition File (.net extension)

The network definition should be submitted within a .net file. The name of the file should be the province identifier and route number with the date (or only the province identifier and date). This filename is used for all the associated data files with only the file extension changing.

The network definition submitted is valid for the start and end date range specified in the field. Should there already be an active network definition loaded, then the new definition file will become available for the range specified. If the range of the new file conflicts with the existing network, the network definition will not be loaded and an error will be returned indicating a date range conflict.

It is important to keep the network definition up-to-date and do so before submitting new data. Only if the network definition has not changed will it not be necessary to update it.

Table 7: Network definition (.net)

Field description	Field name	Length	Data type	Format and description
Authority ID	AUTH_ID	5	TEXT, alphanumeric	The unique id given to an authority, this associates the network link to the relevant authority
Road ID	ROAD_ID	12	TEXT, alphanumeric	The unique id for which data is joined to. See 2.1 for more information.
Route	ROUTE	12	TEXT, alphanumeric	The route that the road belongs to if applicable.
Route Sequence	ROUTE_SEQ	3	NUMERIC Precision 3	Format is 999
Start KM	START_KM	6	NUMERIC, Precision 6 Scale 3	Format is 999.999 Measured in (km) kilometres
End KM	END_KM	6	NUMERIC, Precision 6 Scale 3	Format is 999.999 Measured in (km) kilometres
Start Date	START_DATE	8	DATE	YYYYMMDD
End Date	END_DATE	8	DATE	YYYYMMDD set to NULL if the link is still active
RDDA Road identifier	RDDA_ID	7	TEXT, alphanumeric	character 1 – N for National, R for Regional. chr 2 to 4 Number of road i.e. N002 or R311 chr 5 to 6 Section, i.e. N00231 or R32103 chr 7 Main Direction N,E,W,S. i.e. N00121N If Route is not defined in RDDA document then use seven 0's (see point 2.2.3)

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Provincial/Metro Road Number	AUTH_RD_ID	7	TEXT, alphanumeric	As no direction is built into this number, there will be cases where this is not unique within the dataset. Chr 1-2 – Road Type initial (NR, RR, TR, MR, DR, OP) 3-7 - Road Number and Section where applicable (N.B.: blanks in the road number MUST be zero-filled)
SADC Road Number	SADC_ROUTE	12	TEXT, alphanumeric	The SADC route that the road belongs to if applicable.
Primary Direction of road by Authority	AUTH_RD_DIR	1	TEXT, alphanumeric	Direction of increasing Provincial Km Markers N = North S=South E = East W=West
RCAM Classification	RCAM_CLASS	5	TEXT, alphanumeric	R1: Rural principal distributor R2: Rural major distributor R3: Rural minor distributor R4: Rural collector road R4B: Rural collector road R5: Rural local road R5B: Rural local road R6B: Rural walkway R7B: Other R7C: Other R7D: Other R7E: Other R7F: Other R7G: Other R7H: Other U1: Urban principal arterial U2: Urban major arterial U3: Urban minor arterial U4a: Urban Commercial collector street U4b: Urban Residential collector street U5a: Urban Commercial local street U5b: Urban Residential local street U6a: Urban Pedestrian priority street or area U6b: Urban Pedestrian only street or area
Start Description	START_DESC	100	TEXT, alphanumeric	Description of Start Point
End Description	END_DESC	100	TEXT, alphanumeric	Description of End Point
Geometry Link ID	GIS_LINK_ID	20	TEXT, alphanumeric	A unique identifier linking the road feature in KML file to the record, only use this field if the geometry attribute ID is different to the Road ID. Ideally the Road Id field should match the geometry feature and this field left empty.

Data Example:

The example below is the classification data of the R04601 road both east and west. The authority responsible for the road is been indicated as Eastern Cape Province by the value ECP. As it is a dual carriageway example two road links defined. Both entries are linked to the R046 route and are the first road links defined for the route as indicated by the route sequence number of 1. For dual carriageway roads related road links are defined by sharing the route sequence and the primary directing indicates which side of the road each link represents. The remaining field's descriptions can be found in the table above. Please see the Geometry section for more detail on how to define the related geometry data items, note that in this example the data items are related by the GIS_LINK_ID field with the respective ids being 200 and 201.

```
ECP;R04601E;R046;1;0.00;24.76;20021013;;R04601E;TR02401;;E;R3;R45 Junction 4km
east of Malmesbury;R44 Junction at Hermon;200;(CR) (LF)
ECP;R04601W;R046;1;0.00;24.36;20022008;;R04601W;TR02402;;W;R3;R45 Junction 4km
east of Malmesbury;R44 Junction at Hermon;201;(CR) (LF)
```

Note: In this example the link end date is set to NULL as it is still current, only use the link end date should this definition of the road no longer be current past the end date.

2.2.1 Network Measurements

The geometry data submitted for the network definition file defines the base measurement system for all linear data submitted within the date range specified for the definition. The geometry is used to create the base measurement system, the length of the network is calculated from point to point using an algorithm that takes all three dimensions into account. This makes the geometry data of utmost importance to be as accurate as possible along the network and at a maximum resolution of a point every 20 metres. Should higher resolution data be available then it is advisable to submit it, however a 10m resolution is adequate.

2.2.2 Network History

Each time the alignment of the road changes, it is required to resubmit the network definition file, each new submission establishes a new version of the road. The start and end date become the duration for that road version and all submitted data will then map against the matched road version by the measurement date.

It is critical that the network definitions are maintained and accurate or it could result in incorrect mapping of submitted data. Validation checks will be performed against the data submitted to ensure that data is not submitted outside of the current road versions minimum and maximum km range.

2.2.3 The South African Numbered Route Description and Destination

The South African Numbered Route Description and Destination document of May 2012 indicates that, all the National and Regional Routes in South Africa are listed and described from their origin, through the towns they traverse, up to the points where they end. Some route descriptions will follow other routes where they overlap, but for the purpose of this

document, the route with the smaller denomination will take precedence. Links should not overlap each other.

2.2.4 Provincial Road number

Is unique per Province but not for the whole country. This will mean that in a national database, the provincial route numbers may be duplicated.

2.3 Geometry (.kml or .kmz extension)

Each record in the “Network Definition File” must have a corresponding geometry definition within the geometry file.

The “Road ID” (ROAD_ID) or “GIS_LINK_ID” field must be included in the geometry information in order to associate the geometry entry with the correct road.

2.3.1 Geometry Data KML

The primary geometry data format supported is KML, data must be submitted within a kml or kmz file, the format of the data is required to be in OGC KML 2.2. For more information please consult the following references.

OGC KML Specification documentation on the Open Geo Spatial website [www.opengeospatial.org http://portal.opengeospatial.org/files/?artifact_id=27810](http://portal.opengeospatial.org/files/?artifact_id=27810)

The geometry data contained within the KML file should match the General Road Classification and Information file’s list of link. Each line feature representing a link should have the Link Id attribute set to the value of the matching record. Alternatively the GIS_LINK_ID field can be used. Should the GIS_LINK_ID be set, it is required that the records within the General Road Classification file have the GIS_LINK_ID field populated appropriately to ensure that the data can be joined.

The geometry data file name must match the General Road Classification file name except for extension which must be kml or kmz. Below is an example of a matching file name.

ECP_P0023_2012120119.rcl

ECP_P0023_2012120119.kmz

It is recommended that the kmz format is used as it uses compression to reduce the files size thus reducing the data load for transmission and storage.

2.3.2 KML Geodetic reference system

Please note that all co-ordinates given must conform to the KML geodetic reference system. This is for both the KML files and all co-ordinates given within data files.

For its reference system, KML uses 3D geographic coordinates: longitude, latitude and altitude, in that order, with negative values for west, south and below mean sea level if the altitude data is available. The longitude, latitude components (decimal degrees) are as defined by the World Geodetic System of 1984 (WGS84). The vertical component (altitude) is measured from the WGS84 EGM96 Geoid vertical datum. If altitude is omitted from a coordinate string, e.g. (–122.917, 49.2623) then the default value of 0 (approximately sea level) is assumed for the altitude component, i.e. (–122.917, 49.2623, 0).

A formal definition of the coordinate reference system (encoded as GML) used by KML is contained in the OGC KML 2.2 Specification. This definition references well-known EPSG CRS components.

2.4 KML Elements used for geometry

- <kml> Standard opening tag for a KML file, please note that the appropriate xml declaration should be made above it. See sample section for detail.
- <Document> The document element should contain all the geometries for all sections within the
- <name> Name that represent the route, will be appropriate if the date was added to the name to indicate for time period it represents.
- <Placemark> Each placemark should contain only one link for the route the document represents. Placemarks are a repeatable element and there should be one for each link specified within the rcl file.
- <Placemark id> It is essential that the id of each placemark is set to either the Road id or if specified the gis_link_id
- <Placemark><name> Representing name for the link. The name used for data import will be the one specified within the network definition file, however this field can be included for display purposes of the kml.
- <Placemark><LineString> The geometry element used for the link, if the elevation is not known of the road then it should be set to 0. Note: KML elevation is measured in metres.

2.5 Sample Geometry Data (.kml extension)

A sample kml extract for a road link is given, please note the id of each placemark corresponds to the link id or the gis_link_id specified within the corresponding Network Definition File.

Note: The full sequence of co-ordinates have been removed as there would typically be far too many to display within this document effectively.

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://www.opengis.net/kml/2.2">
<Document id=" ECP_P0023_20120119">
<name>P0023: January 2012</name>
<Placemark id="100">
<name>P002301N</name>
  <LineString>
    <extrude>0</extrude>
    <tessellate>0</tessellate>
    <coordinates 28.6841466620528,-25.9847599989329,1461.099
28.6841699953205,-25.9846633261782,1461.099</coordinates>
  </LineString>
</Placemark>
<Placemark id="102">
<name>P002302N</name>
  <LineString>
    <extrude>0</extrude>
    <tessellate>0</tessellate>
    <coordinates 28.7841466620528,-26.1247599989329,1462.099
28.6841699953205,-26.1246633261782,1462.099</coordinates>
  </LineString>
</Placemark>
```

```
</Document>
</kml>
```

2.6 Geometry example

The screen shots below show a typical visualization of geometry data for the N14 highway section at a 10m resolution. The top left shows a regular Map Backdrop, the right hand side shows the horizontal alignment in red, which is plotted from the 10m data and below the vertical alignment is plotted for the visible section in the map view.

Using the geometry supplied an accurate rolling distance is calculated as the measure reference for the road. Using this reference all data submitted with GPS co-ordinates can be snapped to the road at the calculated km position with a good degree of accuracy. This ensures that data readings keep their spatial position and are not influenced by the vehicles odometer or other methods of network location measures that are not consistently accurate.

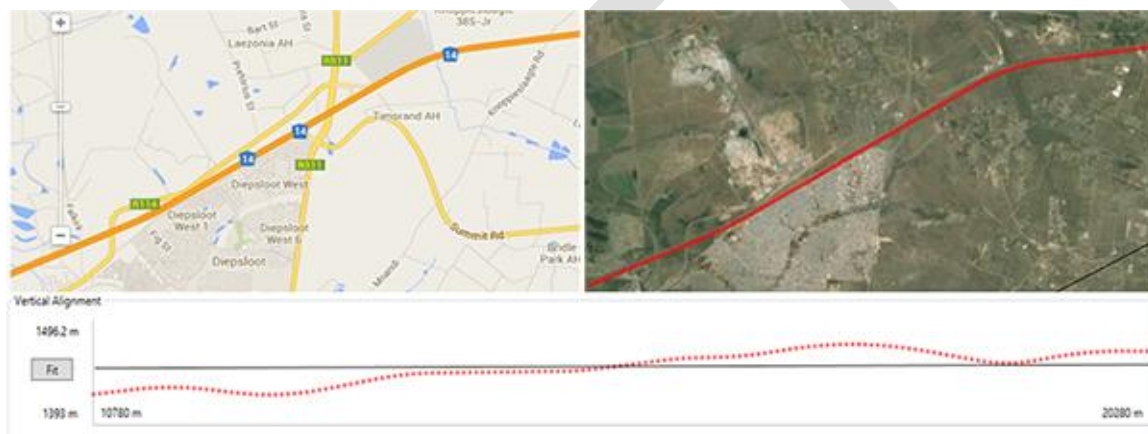


Figure 1 Geometry example visualization

3 Road Classification

3.1 Road Classification File Format (.rcf extension)

The General Road Classification File defines the segments for the classification for each road defined in the network. A segment is created each time one of the road's attributes change, each segment is uniquely identified by the segment ID field which is constructed by using the road ID separated by an underscore and a five digit number which is left-hand side padded with zeros. This number represents the start of the segment in metres.

The following is required for the road classification data;

- There must be at least 1 record for every Road ID in the "Network Definition File".
- The 'Road ID' used must exist in the "Network Definition File" so that segments can be linked to the relevant Road.

- c) The 'Start km' and 'End km' values used in the classification segments, must fall within the 'Start km' and 'End km' values for the related 'Road ID' in the "Network Definition File".

Table 8: Road Classification Information (.rcf)

Field description	Field name	Length	Data type	Format and description
Segment ID	SEG_ID	20	TEXT, alphanumeric	Unique identifier, not null [ROAD_ID]_00000
Start km	START_KM	6	DECIMAL(6, 3)	Format is 999.999 Measured in (km) kilometres
End km	END_KM	6	DECIMAL(6, 3)	Format is 999.999 Measured in (km) kilometres
Start Date	START_DATE	8	DATE	YYYYMMDD
End Date	END_DATE	8	DATE	YYYYMMDD set to NULL if the link is still active
Status	STATUS	1	INTEGER	1 Current 2 To be verified 3 Under construction 4 Planned
Surface Type	SURF_TYPE	4	TEXT, alphanumeric	Unpaved Roads: GRAV gravel EARTH (or sand) TRACK Concrete Pavements: CJP Jointed Concrete plain DJP Dowelled CRC Continuously Reinforced Concrete UTCP Ultra-thin Concrete Reinforced Pavement Flexible Pavements FLEX Bituminous surface Block Pavements BLOC Concrete block paving
Road Type	ROAD_TYPE	3	TEXT, alphanumeric	S2U single unpaved shoulders S2P single paved shoulders N2U undivided unpaved shoulders N2P undivided paved shoulders D2P dual paved shoulders 2 lanes D3P dual paved shoulders 3 lanes etc. DnP dual paved should with n number of lanes example: D4P represents a dual carriageway with 4 lanes per carriageway
Road Width	ROAD_WIDTH	4	DECIMAL(4,2)	Width of paved surface. Gravel roads from shoulder breakpoint to shoulder break point. Format is 99.99 Measured in (m) metres
Number of lanes	NO_LANES	2	INTEGER(2)	Number of lanes. In case of dual carriageways, number of lanes in one direction. Full lane details are supplied in the Lane Definition File.

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Number of shoulders	NO_SHOULDERS	1	INTEGER(1)	Number of shoulders road for the section specified. Full shoulder details are supplied in the Lane Definition File.
Base Date	BASE_DATE	8	DATE	YYYYMMDD – The year the base was constructed or last rehabilitated
Surface Date	SURF_DATE	8	DATE	YYYYMMDD – The year the surface layer was constructed or last resurfaced.
Terrain Classification	TERR_CLASS	1	TEXT, alphanumeric	F Flat terrain, R Rolling terrain M Mountainous terrain
RCAM	RCAM_CLASS	5	TEXT alphanumeric	R1: Rural principal distributor R2: Rural major distributor R3: Rural minor distributor R4: Rural collector road R4B: Rural collector road R5: Rural local road R5B: Rural local road R6B: Rural walkway R7B: Other R7C: Other R7D: Other R7E: Other R7F: Other R7G: Other R7H: Other U1: Urban principal arterial U2: Urban major arterial U3: Urban minor arterial U4a: Urban Commercial collector street U4b: Urban Residential collector street U5a: Urban Commercial local street U5b: Urban Residential local street U6a: Urban Pedestrian priority street or area U6b: Urban Pedestrian only street or area
District	DISTRICT	6	TEXT, alphanumeric	Use district lookup
Local Municipality	MUNIC	6	TEXT, alphanumeric	Use municipality lookup
Responsible Authority	RESP_AUTH	5	TEXT alphanumeric	Should the responsibility for this segment not be the authority specified in the road definition file then the correct authority id must be specified here.
Start Longitude	START_LONGITUDE	12	DECIMAL(12, 9)	Longitude Value in Decimal Degrees World Geodetic System of 1984 (WGS84)
Start Latitude	START_LATITUDE	12	DECIMAL(12, 9)	Latitude Value in Decimal Degrees World Geodetic System of 1984 (WGS84)
End Longitude	END_LONGITUDE	12	DECIMAL(12, 9)	Longitude Value in Decimal Degrees World Geodetic System of 1984 (WGS84)

End Latitude	END_LATITUDE	12	DECIMAL(12, 9)	Latitude Value in Decimal Degrees World Geodetic System of 1984 (WGS84)
Segment Status	SEGMENT_STATUS	20	TEXT, alphanumeric	1 Built 2 To be Verified 3 Under Construction 4 New Link 5 Upgrade to Paved 6 Road Closed 7 Inaccessible 8 Track

Example Data:

```
R54001N_000000;0.00;8.00;20100110;;1;FLEX;S2P;11.4;2;1;20000201;20080201;F;U1;1;
10000;20000;GAU;-25.927733;27.902582;1;(CR) (LF)

R54001N_008000;8.00;12.00;20100110;;1;FLEX;S2P;16.4;3;1;20000201;20080201;F;U1;1;
10000;20000;GAU;-25.945197;27.807632;1;(CR) (LF)

R54001N_012000;12.00;14.00;20100110;;1;CRCP;S2P;16.4;3;1;20020201;20080201;R;U1;
1;10000;20000;GAU;-26.023740;27.766433;1;(CR) (LF)
```

4 Lane Configuration Details

4.1 Primary Direction

The primary direction for a road is determined by the side that is increasing in kilometres towards either of the primary geographical directions, North or East. This side of the road is then labelled the 'primary direction', the opposite side of the road would be the 'secondary direction'. This is done for the entire route, not each individual section of road as some sections might change orientation during its course. Thus once the primary direction is determined it is applied to all sections within it.

4.2 Lane Code definition

In order to identify which lane and direction the data represents, a uniform lane numbering system has been defined. The code is comprised of the following three components direction, lane type and lane position.

Direction is defined as either primary or secondary.

The lane type code is left blank in the case of regular travel lanes however F and S are used for the fast and slow shoulders respectively.

Lastly the lanes are numbered with the fast lane being represented by the number 1 and each lane number is then incremented by 1 going towards the slowest lane.

Please see previous section for method to determine the primary and secondary direction.

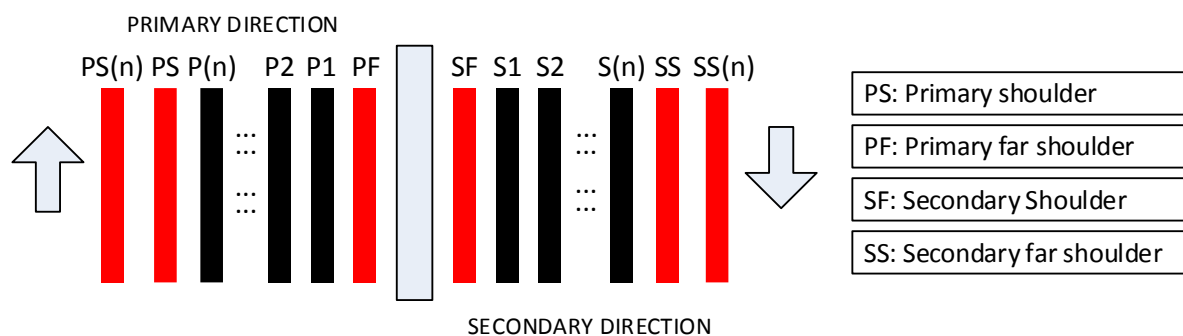


Figure 2 Lane code numbering

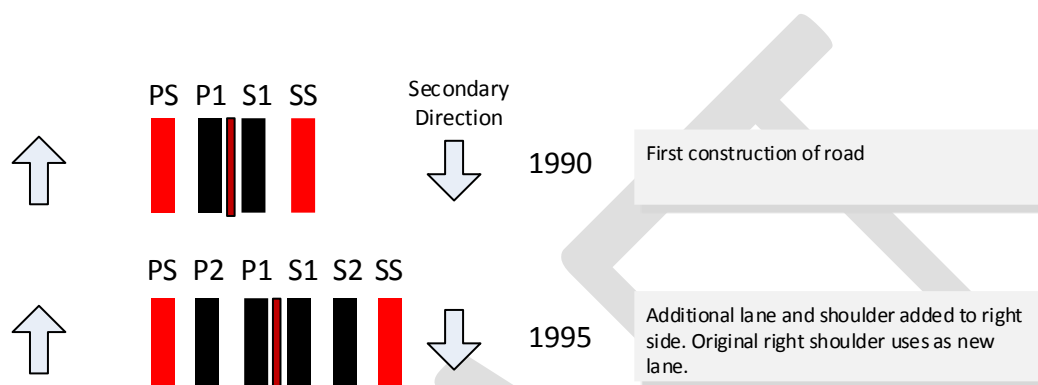


Figure 3 Lane code numbering with road configuration changes

4.3 Lane Configuration File (.lan extension)

The lane configuration file contains detailed definition of each lane for each road segment.

Table 9: Lane configuration Information (.lan)

Field Description	Field Name	Length	DATA TYPE	Format and description
Lane Segment ID	LANE_SEG_ID	20	TEXT, alphanumeric	Unique identifier, not null [ROAD_ID]_[LANE_CODE]_00000
Start km	START_KM	6	DECIMAL(6,3)	Format is 999.999 Measured in (km) kilometres
End km	END_KM	6	DECIMAL(6,3)	Format is 999.999 Measured in (km) kilometres
Lane Width	SHOULDER_WIDTH	4	DECIMAL(4,2)	Width of lane in metres Format is 99.99 Measured in (m) metres
Centre Line Offset	CL_OFFSET	5	DECIMAL(5,2)	Offset of the nearest side of the lane from the centre line. Format is 999.99 Measured in (m) metres
Shoulder Type	SHOULDER_TYPE	20	TEXT, alphanumeric	GRAVEL PAVED

Example Data:

```

R04601E_P1_000000;0.00;8.00;2.2;0.2;; (CR) (LF)
R04601E_P1_008000;8.00;12.00;2.4;0.2;; (CR) (LF)
R04601E_P1_012000;12.00;14.00;2.2;0.2;; (CR) (LF)
R04601E_S1_000000;0.00;8.00;2.2;-0.2;; (CR) (LF)
R04601E_S1_008000;8.00;12.00;2.4;-0.2;; (CR) (LF)
R04601E_S1_012000;12.00;14.00;2.2;-0.2;; (CR) (LF)
R04601E_PS_000000;0.00;8.00;1.8;2.4;PAVED; (CR) (LF)
R04601E_PS_008000;8.00;12.00;2.0;2.6;PAVED; (CR) (LF)
R04601E_PS_012000;12.00;14.00;1.8;-2.4;PAVED; (CR) (LF)
R04601E_SS_000000;0.00;8.00;1.8;-2.4;PAVED; (CR) (LF)
R04601E_SS_008000;8.00;12.00;2.0;-2.6;PAVED; (CR) (LF)
R04601E_SS_012000;12.00;14.00;1.8;-2.4;PAVED; (CR) (LF)

```

4.4 Traffic Link Volume (.adt extension)

Table 10: Traffic Link Volume (.adt)

Column Description	Column Heading	Length	DATA TYPE	Format
Road ID	ROAD_ID	12	TEXT, alphanumeric	Unique Road Id from Network Definition
Lane Code	LANE_CODE	4	TEXT, alphanumeric	Lane Code representing direction P or S.
Start km	START_KM	6	DECIMAL(6,3)	Format is 999.999 Measured in (km) kilometres
End km	END_KM	6	DECIMAL(6,3)	Format is 999.999 Measured in (km) kilometres
Date of Last Count	DT_LST_CNT	6	DATE	Format is YYYYMMDD
AADT Light	AADT_L	6	INTEGER(6)	Format is 999999
AADT Minibus	AADT_M	6	INTEGER(6)	Format is 999999
AADT Bus	AADT_B	6	INTEGER(6)	Format is 999999
AADT Truck Short	AADT_TS	6	INTEGER(6)	Format is 999999
AADT Truck Medium	AADT_TM	6	INTEGER(6)	Format is 999999
AADT Truck Long	AADT_TL	6	INTEGER(6)	Format is 999999
AADT Total	AADT	6	INTEGER(6)	Format is 999999
Start Longitude	START_LONGITUDE	12	DECIMAL(12,9)	Longitude Value in Decimal Degrees World Geodetic System of 1984 (WGS84)
Start Latitude	START_LATITUDE	12	DECIMAL(12,9)	Latitude Value in Decimal Degrees World Geodetic System of 1984 (WGS84)
From Node	FROM_NODE	100	TEXT, alphanumeric	Optional
To Node	TO_NODE	100	TEXT, alphanumeric	Optional
From Node Type	FROM_NODE_TYPE	20	TEXT, alphanumeric	Optional + : Road crossing/Intersection BD: Begin Dual

				BEGIN Begin Freeway BO: Borders/Boundaries (BOUND: Boundary) BR: OVER BRIDGE BS:UB: Begin Subsidy CP Change of Pavement Type CLOSED Closed/Gated ED End Dual EN: End of segment (no node) END End of Road EP End of Paved Segment (ET End Tar) ESUB End Subsidy EV MBOUND Municipal Boundary ORIR SP: start of Paved Segment (BT Begin Tar) ST: start of segment (no node) SV T T Junction TL T Junction Left TR T Junction Right V VILLAGE/ TOWN MX: Maximum segment length used as segment end
To Node Type	TO_NODE_TYP E	20	TEXT, alphanumeric	Optional

Example:

The Link volume in terms Average Annual Daily Traffic (AADT) for Main Road 310 (MR00310) (R303 Section 1), between start km 0.00 and end km 16.34 is 910 for Light vehicles, 25 for Heavy vehicles, with a Total of 935. In cases where Light and Trucks are not counted separately, supply only total AADT, with null (none) values in columns for AADT Heavy and AADT Light. Do not populate with zeros where data is not available. If buses and taxis are counted separately, buses should be added to AADT Truck Medium while taxis should be added to AADT Light.

Data example:

```
MR00310;P;0;16,20121201,3432;120;54;250;33;42,2560;-25.927733;27.902582;;; (CR) (LF)
MR00310;S;0;16,20121201,3234;123;50;270;23;43,2562;-25.927733;27.902582;;; (CR) (LF)
```

5 Pavement Data Submission Types

Only the data for the latest measurement date must be delivered when delivering data on a yearly basis.

The start and end km of the data values must fall within the start and end km of the road defined in the network definition file. Any values that fall outside of the road start and end km will be discarded.

5.1 Standard segment lengths for different road types

Table 11: Segment lengths by road type

Type of pavement	Standard Assessment Length (km)	
	Rural	Urban
Flexible	2.0	Block lengths (max 0.5 km)
Concrete	0.2	0.2
Block	0.2	0.2
Unpaved	5.0	Block lengths (max 0.5 km)

Note: Assessment lengths should not exceed $\pm 50\%$ of standard

5.2 Flexible Pavement Surfaced Visual Condition Summary (.vcf extension)

See TMH 9 Part B for detailed specification on the visual condition for flexible pavement.

Table 12: Flexible Pavement Visual Condition (.vcf)

Column Description	Column Heading	Length	DATA TYPE	Format and details
Road ID	ROAD_ID	12	TEXT, alphanumeric	Senders Unique Road Id
Lane Code	LANE_CODE	4	TEXT, alphanumeric	Lane Code representing both direction and lane position. (P1, P2, S1 etc.)
Start km	START_KM	6	DECIMAL(6,3)	The START_KM, END_KM must fall within the range of a record in the Road classification table where the SURF_TYPE is indicated as FLEX Format is 999.99 Measured in (km) kilometres
End km	END_KM	6	DECIMAL(6,3)	The START_KM, END_KM must fall within the range of a record in the Road classification table where the SURF_TYPE is indicated as FLEX Format is 999.99 Measured in (km) kilometres
Terrain Classification Same as in Classification table	TERR_CLASS	1	TEXT, alphanumeric	Format is 'A' 'F' for a Flat terrain, 'R' for a Rolling terrain 'M' for a mountainous terrain
Gradient	GRADIENT	1	TEXT, alphanumeric	F: Flat M: Medium S: Steep
Road Width	ROAD_WIDTH	4	NUMERIC, fixed 1	Width of paved surface. Gravel roads from shoulder breakpoint to shoulder break point.
Date of measurement	MEASURE_DATE	13	DATE/TIME	YYYYMMDD HH24:MI:SI

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Visual Condition Index (VCI)	VCI	4	DECIMAL(4,1)	Format is 999.9
Reseal Condition Index (RCI)	RCI	4	DECIMAL(4,1)	Format is 999.9
Maintenance Need Index (MNI)	MNI	4	DECIMAL(4,1)	Format is 999.9
Surface Condition Index (SCI)	SCI	4	DECIMAL(4,1)	Format is 999.9
Structural Condition Index (STCI)	STCI	4	DECIMAL(4,1)	Format is 999.9
Functional Condition Index (FCI)	FCI	4	DECIMAL(4,1)	Format is 999.9
Crack Condition Index (CCI)	CCI	4	DECIMAL(4,1)	Format is 999.9
Engineering Assessment (surfacing):				
Current Surface	SURFACE	2	TEXT, alphanumeric	TRH 14 codes for different surfacing types Code - Description: AC - Asphalt surfacing - continuously-graded. AG - Asphalt surfacing - gap-graded. AS - Asphalt surfacing – semi-gap-graded. AO -Asphalt surfacing - open-graded. S1 - Surface Treatment – single seal S2 - Surface Treatment – multiple seal S3 - Sand Seal S4 - Cape Seal / Single seal and slurry S5 - Slurry Seal
Texture	TEXTURE	30	TEXT, alphanumeric	Coarse Medium Fine Varying The texture can be expressed as fine, fine-medium, medium, medium-coarse or coarse, or varying, if it varies across the width of the road. The texture can be marked as “Varying” and “Fine” to “Coarse”. See TMH 9 Part B
Voids	VOIDS	30	TEXT, alphanumeric	None Few Many Varying Ratings between the major classes can also be recorded (None – Few or Few – Many)
Surfacing failures Degree	SURFACE_FAILURE_DEG	1	INTEGER(1)	1-5
Surfacing failures Extent	SURFACE_FAILURE_EXT	1	INTEGER(1)	1-5
Surfacing patching Degree	SURFACE_FAILPATCH_DEG	1	INTEGER(1)	1-5
Surfacing patching Extent	SURFACE_FAILPATCH_EXT	1	INTEGER(1)	1-5

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Surfacing Degree	cracks	SURFACE_CRACK_DEG	1	INTEGER(1)	1-5
Surfacing Extent	cracks	SURFACE_CRACK_EXT	1	INTEGER(1)	1-5
Aggregate Degree	loss	AGGR_LOSS_DEG	1	INTEGER(1)	1-5
Aggregate Extent	loss	AGGR_LOSS_EXT	1	INTEGER(1)	1-5
Aggregate Activity	loss	AGGR_LOSS_ACT	1	TEXT, alphanumeric	A - Active N - Non-Active
Binder condition (Dry/Brittle) Degree	condition	BINDER_CONDITION_DEG	1	INTEGER(1)	1-5
Binder condition (Dry/Brittle) Extent	condition	BINDER_CONDITION_EXT	1	INTEGER(1)	1-5
Bleeding / flushing (fattiness) Degree		BLEEDING_DEG	1	INTEGER(1)	1-5
Bleeding / flushing (fattiness) Extent		BLEEDING_EXT	1	INTEGER(1)	1-5
Surface deformation / Shoving Degree		SURF_DEFORM_DEG	1	INTEGER(1)	1-5
Surface deformation / Shoving Extent		SURF_DEFORM_EXT	1	INTEGER(1)	1-5
Engineering Assessment (structural):					
Block Cracks Degree		BLOCK_CRACK_DEG	1	INTEGER(1)	1-5
Block Cracks Extent		BLOCK_CRACK_EXT	1	INTEGER(1)	1-5
Longitudinal/Slip Cracks Degree		LONG_CRACK_DEG	1	INTEGER(1)	1-5
Longitudinal/Slip Cracks Extent		LONG_CRACK_EXT	1	INTEGER(1)	1-5
Longitudinal/Slip Cracks Type		LONG_CRACK_TYPE	1	TEXT, alphanumeric	S - Slip L – Longitudinal
Transverse cracks Degree	cracks	TRANSVERSE_CRACK_DEG	1	INTEGER(1)	1-5
Transverse cracks Extent	cracks	TRANSVERSE_CRACK_EXT	1	INTEGER(1)	1-5
Crocodile (fatigue) cracks Degree		CROCODILE_CRACK_DEG	1	INTEGER(1)	1-5
Crocodile (fatigue) cracks extent		CROCODILE_CRACK_EXT	1	INTEGER(1)	1-5
Pumping Degree		PUMPING_DEG	1	INTEGER(1)	1-5
Pumping Extent		PUMPING_EXT	1	INTEGER(1)	1-5
Deformation: Rutting Degree		RUTTING_DEG	1	INTEGER(1)	1-5
Deformation: Rutting Extent		RUTTING_EXT	1	INTEGER(1)	1-5
Deformation: Undulation/Settlement Degree		UNDULATION_DEG	1	INTEGER(1)	1-5
Deformation: Undulation/Settlement Extent		UNDULATION_EXT	1	INTEGER(1)	1-5

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Patching Degree	PATCHING_DEG	1	INTEGER(1)	1-5
Patching Extent	PATCHING_EXT	1	INTEGER(1)	1-5
Potholes Degree	POTHOLES_DEG	1	INTEGER(1)	1-5
Potholes Extent	POTHOLES_EXT	1	INTEGER(1)	1-5
Failures Degree	FAILURES_DEG	1	INTEGER(1)	1-5
Failures Extent	FAILURES_EXT	1	INTEGER(1)	1-5
Functional Assessment				
Roughness (Riding quality) Degree	RIDING_QUAL_DEG	1	INTEGER(1)	1: Very Good 2: Good 3: Moderate 4: Poor 5: Very Poor
Roughness (Riding quality) Problems: Potholes	RQUAL_PROB_HOLE	1	TEXT, alphanumeric	HOLE Potholes Y or N
Roughness (Riding quality) Problems: Patching	RQUAL_PROB_PATCH	1	TEXT, alphanumeric	PATCH Patching Y or N
Roughness (Riding quality) Problems: Undulations	RQUAL_PROB_UNDUL	1	TEXT, alphanumeric	UNDUL Undulations Y or N
Roughness (Riding quality) Problems: General Unevenness	RQUAL_PROB_UNEVEN	1	TEXT, alphanumeric	UNEVEN Gen Uneven Y or N
Roughness (Riding quality) Problems: Corrugations	RQUAL_PROB_CORR	1	TEXT, alphanumeric	CORR Corrugations Y or N
Skid Resistance Degree	SKID_RESISTANCE_DEG	1	INTEGER(1)	1: Very Good 2: Good 3: Moderate 4: Poor 5: Very Poor
Skid Resistance Problems: Bleeding	SKID_PROB_BLEED	1	TEXT, alphanumeric	BLEED Bleeding Y or N
Skid Resistance Problems: Polished	SKID_PROB_POLISH	1	TEXT, alphanumeric	POLISH Polished Y or N
Surface Drainage	DRAINAGE_SURFACE	13	TEXT, alphanumeric	Adequate, Inconsistent, Inadequate
Surface Drainage Problems: Rutting	DRAIN_PROB_RUT	1	TEXT, alphanumeric	Rutting Y or N
Surface Drainage Problems: Shoulders	DRAIN_PROB_SHOULDER	1	TEXT, alphanumeric	Shoulders Y or N
Surface Drainage Problems: Alignment	DRAIN_PROB_ALIGNMENT	1	TEXT, alphanumeric	Alignment Y or N

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Surface Drainage Problems: Side Drains	DRAIN_PROB_SIDE	1	TEXT, alphanumeric	Side Drains Y or N
Untraveled way (Unpaved shoulders)	UNPAVED_SHOULDER	1	TEXT, alphanumeric	N: None, S: Safe, I: Inconsistent, U: Unsafe
Untraveled way (Unpaved shoulders) Problems: Eroded	UNPAVED_PROB_ERODED	1	TEXT, alphanumeric	Eroded Y or N
Untraveled way (Unpaved shoulders) Problems: Overgrown	UNPAVED_PROB_OGROWN	1	TEXT, alphanumeric	Overgrown Y or N
Untraveled way (Unpaved shoulders) Problems: Inclined	UNPAVED_PROB_INCLINED	1	TEXT, alphanumeric	Inclined Y or N
Untraveled way (Unpaved shoulders) Problems: Too high	UNPAVED_PROB_2HIGH	1	TEXT, alphanumeric	Too high Y or N
Untraveled way (Unpaved shoulders) Problems: Too narrow	UNPAVED_PROB_2NARROW	1	TEXT, alphanumeric	Too narrow Y or N
Edge defects: Edge breaks Degree	EDGE_BREAK_DEGREE	1	INTEGER(1)	1-5
Edge defects: Edge breaks Extent	EDGE_BREAK_EXTENT	1	INTEGER(1)	1-5
Edge defects: Short transverse cracks Degree	EDGE_CRACKS_DEGREE	1	INTEGER(1)	1-5
Edge defects: Short transverse cracks Extent	EDGE_CRACKS_EXTENT	1	INTEGER(1)	1-5
Edge defects: Drop-off Degree	EDGE_DROPOFF_DEGREE	1	INTEGER(1)	1-5
Edge defects: Drop-off Extent	EDGE_DROPOFF_EXTENT	1	INTEGER(1)	1-5
Overall Pavement Condition	OPC	1	INTEGER(1)	1: Very Good 2: Good 3: Moderate 4: Poor 5: Very Poor
Other Problems: Service Crossings	OTHER_PROB_CROSSINGS	1	TEXT, alphanumeric	Service Crossings Y or N
Other Problems: Trees	OTHER_PROB_TREES	1	TEXT, alphanumeric	Trees Y or N
Other Problems: Moles	OTHER_PROB_MOLES	1	TEXT, alphanumeric	Moles Y or N
Other Problems: Mechanical Damage	OTHER_PROB_DAMAGE	1	TEXT, alphanumeric	Mechanical Damage Y or N

Comments	COMMENTS	100	TEXT, alphanumeric	
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5.3 Concrete Visual Condition Summary (.vcc extension)

See TMH 9 Part B for detailed specification on the visual condition for concrete pavement. An assessment segment is the length of road for which one assessment rating is recorded. It is 0.2km for concrete pavements.

Table 13: Concrete Types

Code	Concrete type
CJP	Jointed Concrete plain
DJP	Dowelled
CRC	Continuously Reinforced Concrete
UTCRC	Ultra-thin Concrete Reinforced Pavement

Table 14: Concrete Visual Condition (.vcc)

Column Description	Column Heading	Length	DATA TYPE	Format
Road ID	ROAD_ID	12	TEXT, alphanumeric	Senders Unique Network Road Id The foreign id to which data is joined to in the network table
Lane Code	LANE_CODE	4	TEXT, alphanumeric	Lane Code representing both direction and lane position. (P1, P2, S1 etc.)
Start km	START_KM	6	DECIMAL(6,3)	The START_KM, END_KM must fall within the range of a record in the Road classification table where the SURF_TYPE is indicated as concrete (CJP, DJP, CRC, UTCP) Format is 999.999 Measured in (km) kilometres
End km	END_KM	6	DECIMAL(6,3)	Format is 999.99 The START_KM, END_KM must fall within the range of a record in the Road classification table where the SURF_TYPE is indicated as concrete (CJP, DJP, CRC, UTCP) Format is 999.999 Measured in (km) kilometres
Road Authority Owner/Authority Same as in Classification table	OWNER	6	TEXT, alphanumeric	SANRAL (National) Provincial Municipality (Local)
Terrain Classification	TERR_CLASS	1	TEXT, alphanumeric	Format is 'A'

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Same as in Classification table				'F' for a Flat terrain, 'R' for a Rolling terrain 'M' for a mountainous terrain
Gradient	GRADIENT	1	TEXT, alphanumeric	F: Flat M: Medium S: Steep
Road Width	ROAD_WIDTH	4	DECIMAL(4,2)	Width of paved surface. Gravel roads from shoulder breakpoint to shoulder break point. Format is 99.99
Date of measurement	MEASURE_DATE	13	DATE/TIME	YYYYMMDD HH24:MI:SI
Surface Type	SURF_TYPE	4	TEXT, alphanumeric	Concrete Pavements: CJP Jointed Concrete plain DJP Dowelled CRC Continuously Reinforced Concrete UTCRC Ultra-thin Concrete Reinforced Pavement
Visual Condition Index (VCI)	VCI	4	DECIMAL(4,1)	Format is 999.9
Reseal Condition Index (RCI)	RCI	4	DECIMAL(4,1)	Format is 999.9
Maintenance Need Index (MNI)	MNI	4	DECIMAL(4,1)	Format is 999.9
Surface Condition Index (SCI)	SCI	4	DECIMAL(4,1)	Format is 999.9
Structural Condition Index (STCI)	STCI	4	DECIMAL(4,1)	Format is 999.9
Functional Condition Index (FCI)	FCI	4	DECIMAL(4,1)	Format is 999.9
Crack Condition Index (CCI)	CCI	4	DECIMAL(4,1)	Format is 999.9
Random Cracking Degree	RANDOM_CRACK_DEG	1	INTEGER(1)	Concrete (JCP, CRC, UTCRC) 1-5
Random Cracking Extent	RANDOM_CRACK_EXT	1	INTEGER(1)	Concrete (JCP, CRC, UTCRC) 1-5
Transverse cracks Degree	TRANSVERSE_CRACK_DEG	1	INTEGER(1)	Concrete (JCP, CRC, UTCRC) 1-5
Transverse cracks Extent	TRANSVERSE_CRACK_EXT	1	INTEGER(1)	Concrete (JCP, CRC, UTCRC) 1-5
Longitudinal cracking Degree	LONG_CRACK_DEG	1	INTEGER(1)	Concrete (JCP, CRC, UTCRC) 1-5

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Longitudinal cracking Extent	LONG_CRACK_EXT	1	INTEGER(1)	Concrete (JCP, CRC, UTCRC) 1-5
Corner cracking Degree	CORNER_CRACK_DEG	1	INTEGER(1)	Concrete (JCP) 1-5
Corner cracking Extent	CORNER_CRACK_EXT	1	INTEGER(1)	Concrete (JCP) 1-5
Cluster cracking Degree	CLUSTER_CRACK_DEG	1	INTEGER(1)	Concrete (CRC, UTCRC) 1-5
Cluster cracking Extent	CLUSTER_CRACK_EXT	1	INTEGER(1)	Concrete (CRC, UTCRC) 1-5
Pumping Degree	PUMPING_DEG	1	INTEGER(1)	Concrete (JCP, CRC, UTCRC) 1-5
Pumping Extent	PUMPING_EXT	1	INTEGER(1)	Concrete (JCP, CRC, UTCRC) 1-5
Joint seal condition Degree	JOINT_SEAL_DEG	1	INTEGER(1)	Concrete (JCP, CRC, UTCRC) 1-5
Joint seal condition Extent	JOINT_SEAL_EXT	1	INTEGER(1)	Concrete (JCP, CRC, UTCRC) 1-5
Faulting Degree	FAULT_DEG	1	INTEGER(1)	Concrete (JCP) 1-5
Faulting Extent	FAUL_EXT	1	INTEGER(1)	Concrete (JCP) 1-5
Undulation/Settlement Degree	UNDULATION_DEG	1	INTEGER(1)	Concrete (JCP, CRC, UTCRC) 1-5
Undulation/Settlement Extent	UNDULATION_EXT	1	INTEGER(1)	Concrete (JCP, CRC, UTCRC) 1-5
Punch-outs Degree	PUNCH_DEG	1	INTEGER(1)	Concrete (CRC, UTCRC) 1-5
Punch-outs Extent	PUNCH_EXT	1	INTEGER(1)	Concrete (CRC, UTCRC) 1-5
Shattered slabs Degree	SHATTERED_DEG	1	INTEGER(1)	Concrete (JCP, CRC, UTCRC) 1-5
Shattered slabs Extent	SHATTERED_EXT	1	INTEGER(1)	Concrete (JCP, CRC, UTCRC) 1-5
Patching Degree	PATCHING_DEG	1	INTEGER(1)	Concrete (JCP, CRC, UTCRC) 1-5
Patching Extent	PATCHING_EXT	1	INTEGER(1)	Concrete (JCP, CRC, UTCRC) 1-5

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Texture	TEXTURE	30	TEXT, alphanumeric	Coarse Medium Fine Varying The texture can be expressed as fine, fine-medium, medium, medium-coarse or coarse, or varying, if it varies across the width of the road. The texture can be marked as "Varying" and "Fine" to "Coarse". See TMH 9 Part C
Functional Assessment				
Roughness (Riding quality) Degree	RIDING_QUAL_DEG	1	INTEGER(1)	1: Very Good 2: Good 3: Moderate 4: Poor 5: Very Poor
Roughness (Riding quality) Problems: Punch Outs	RQUAL_PROB_PUNCH	1	TEXT, alphanumeric	Punch Outs Y or N
Roughness (Riding quality) Problems: Shattered Slabs	RQUAL_PROB_SHATTERED	1	TEXT, alphanumeric	Shattered Slabs Y or N
Roughness (Riding quality) Problems: Patching	RQUAL_PROB_PATCH	1	TEXT, alphanumeric	PATCH Patching Y or N
Roughness (Riding quality) Problems: Undulations	RQUAL_PROB_UNDUL	1	TEXT, alphanumeric	UNDUL Undulations Y or N
Roughness (Riding quality) Problems: Faulting	RQUAL_PROB_FAULT	1	TEXT, alphanumeric	Faulting Y or N
Skid Resistance Degree	SKID_RESISTANCE_DEG	1	INTEGER(1)	1: Very Good 2: Good 3: Moderate 4: Poor 5: Very Poor
Surface Drainage	DRAINAGE_SURFACE	13	TEXT, alphanumeric	Adequate, Inconsistent, Inadequate
Surface Drainage Problems: Rutting	DRAIN_PROB_RUT	1	TEXT, alphanumeric	Rutting Y or N
Surface Drainage Problems: Shoulders	DRAIN_PROB_SHOULDER	1	TEXT, alphanumeric	Shoulders Y or N
Surface Drainage Problems: Alignment	DRAIN_PROB_ALIGNMENT	1	TEXT, alphanumeric	Alignment Y or N

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Surface Drainage Problems: Side Drains	DRAIN_PROB_SIDE	1	TEXT, alphanumeric	Side Drains Y or N
Untraveled way (Unpaved shoulders)	UNPAVED_SHOULDER	1	TEXT, alphanumeric	N: None, S: Safe, I: Inconsistent, U: Unsafe
Untraveled way (Unpaved shoulders) Problems: Erosion by water/traffic	UNPAVED_PROB_ERODED	1	TEXT, alphanumeric	Eroded Y or N
Untraveled way (Unpaved shoulders) Problems: Wearing out by traffic	UNPAVED_PROB_WEARING	1	TEXT, alphanumeric	Wear Out Y or N
Untraveled way (Unpaved shoulders) Problems: Inclined – differences in level between edge of carriage way and shoulder	UNPAVED_PROB_INCLINED	1	TEXT, alphanumeric	Inclined Y or N
Untraveled way (Unpaved shoulders) Problems: Overgrown	UNPAVED_PROB_OGROWN	1	TEXT, alphanumeric	Overgrown Y or N
Untraveled way (Unpaved shoulders) Problems: Too high	UNPAVED_PROB_2HIGH	1	TEXT, alphanumeric	Too high Y or N
Untraveled way (Unpaved shoulders) Problems: Too narrow	UNPAVED_PROB_2NARROW	1	TEXT, alphanumeric	Too narrow Y or N
Overall Pavement Condition	OPC	1	INTEGER(1)	1: Very Good 2: Good 3: Moderate 4: Poor 5: Very Poor
Other Problems: Crushing	OTHER_PROB_CRUSHING	1	TEXT, alphanumeric	Crushing of the slab as a result of expansion under hot weather as well as poor concrete. Y or N
Other Problems: Blow up	OTHER_PROB_BLOWUP	1	TEXT, alphanumeric	Blow-up or lifting of a thin UTCRCP slab as a result of expansion under hot weather. In this case at a construction joint Y or N
Other Problems: Secondary Reaction	OTHER_PROB_REACTION	1	TEXT, alphanumeric	Clear signs of secondary reaction between aggregate and cement, probably alkali-silica reaction, occurring close to joints or cracks. Y or N
Comments	COMMENTS	100	TEXT, alphanumeric	

5.4 Block Visual Condition Summary (.vcb extension)

See TMH 9 Part D for detailed specification on the visual condition for block pavement.

Table 15: Block Visual Condition (.vcb)

Column Description	Column Heading	Length	DATA TYPE	Format
Road ID	ROAD_ID	12	TEXT, alphanumeric	Senders Unique Network Road Id The foreign id to which data is joined to in the network table
Lane Code	LANE_CODE	4	TEXT, alphanumeric	Lane Code representing both direction and lane position. (P1, P2, S1 etc.)
Start km	START_KM	6	DECIMAL(6,3)	The START_KM, END_KM must fall within the range of a record in the Road classification table where the SURF_TYPE is indicated as concrete (CJP, DJP, CRC, UTCP) Format is 999.999 Measured in (km) kilometres
End km	END_KM	6	DECIMAL(6,3)	The START_KM, END_KM must fall within the range of a record in the Road classification table where the SURF_TYPE is indicated as concrete (CJP, DJP, CRC, UTCP) Format is 999.99 Measured in (km) kilometres
Road Authority Owner/Authority Same as in Classification table	OWNER	6	TEXT, alphanumeric	SANRAL (National) Provincial Municipality (Local)
Terrain Classification Same as in Classification table	TERR_CLASS	1	TEXT, alphanumeric	Format is 'A' 'F' for a Flat terrain, 'R' for a Rolling terrain 'M' for a mountainous terrain
Gradient	GRADIENT	1	TEXT, alphanumeric	F: Flat M: Medium S: Steep
Road Width	ROAD_WIDTH	4	DECIMAL(4,2)	Width of paved surface. Gravel roads from shoulder breakpoint to shoulder break point. Format 99.99

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				Measured in (m) metres
Date of measurement	MEASURE_DATE	13	DATE/TIME	YYYYMMDD HH24:MI:SI
Block Shape Code	BLOCK_TYPE	3	TEXT, alphanumeric	S-A Blocks which allow geometrical interlock between ALL vertical faces of adjacent blocks. S-B Blocks which allow geometrical interlock between some faces of adjacent blocks. S-C Blocks which allow no geometrical interlock between adjacent faces.
Lay Pattern	BLOCK_LAY	2	TEXT, alphanumeric	HB Herring-bone SB Stretcher-bond BW Basket Weave OT Other
Block thickness	BLOCK_THICK	3	NUMERIC	B lock thickness in mm (should be between 50 and 80 mm)
Chamfers	CHAMFERS	2	TEXT, alphanumeric	45 – 45 degree angle R – rounded 90 - none
Visual Condition Index (VCI)	VCI	4	DECIMAL(4,1)	Format is 999.9
Reseal Condition Index (RCI)	RCI	4	DECIMAL(4,1)	Format is 999.9
Maintenance Need Index (MNI)	MNI	4	DECIMAL(4,1)	Format is 999.9
Surface Condition Index (SCI)	SCI	4	DECIMAL(4,1)	Format is 999.9
Structural Condition Index (STCI)	STCI	4	DECIMAL(4,1)	Format is 999.9
Functional Condition Index (FCI)	FCI	4	DECIMAL(4,1)	Format is 999.9
Crack Condition Index (CCI)	CCI	4	DECIMAL(4,1)	Format is 999.9
Spalled/ cracked/ broken blocks degree	SPALLED_CRACK_DEG	1	INTEGER(1)	1-5
Spalled/ cracked/ broken blocks extent	SPALLED_CRACK_EXT	1	INTEGER(1)	1-5
Block surface integrity (Durability) Degree	SURF_INTEGRITY_DEG	1	INTEGER(1)	1-5
Block surface integrity (Durability) Extent	SURF_INTEGRITY_EXT	1	INTEGER(1)	1-5
Loss of jointing sand Degree	JOINT_LOSS_DEG	1	INTEGER(1)	1-5
Loss of jointing sand Extent	JOINT_LOSS_EXT	1	INTEGER(1)	1-5
Edge Restraint (or Anchor Beam) Damage Degree	EDGE_DAMAGE_DEG	1	INTEGER(1)	1-5
Edge Restraint (or Anchor Beam) Damage Extent	EDGE_DAMAGE_EXT	1	INTEGER(1)	1-5

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Deformation: Rutting Degree	RUTTING_DEG	1	INTEGER(1)	1-5
Deformation: Rutting Extent	RUTTING_EXT	1	INTEGER(1)	1-5
Potholes/Patching/Reinstatement Degree	POT_PATCH_DEG	1	INTEGER(1)	1-5
Potholes/Patching/Reinstatement Extent	POT_PATC_EXT	1	INTEGER(1)	1-5
Undulation/Settlement Degree	UNDULATION_DEG	1	INTEGER(1)	1-5
Undulation/Settlement Extent	UNDULATION_EXT	1	INTEGER(1)	1-5
Functional Assessment				
Roughness (Riding quality) Degree	RIDING_QUAL_DEG	1	INTEGER(1)	1: Very Good 2: Good 3: Moderate 4: Poor 5: Very Poor
Roughness (Riding quality) Problems: Potholes/failures/Patching	RQUAL_PROB_PATCH	1	TEXT, alphanumeric	Potholes, Failures, Patching Y or N
Roughness (Riding quality) Problems: Loose blocks	RQUAL_PROB_LOOSE	1	TEXT, alphanumeric	Loose blocks because of loss of jointing sand; Y or N
Roughness (Riding quality) Problems: Undulations/Settlement	RQUAL_PROB_UNDUL	1	TEXT, alphanumeric	UNDUL Undulations Y or N
Skid Resistance Degree	SKID_RESISTANCE_DEG	1	INTEGER(1)	1: Very Good 2: Good 3: Moderate 4: Poor 5: Very Poor
Surface Drainage	DRAINAGE_SURF	13	TEXT, alphanumeric	Adequate, Inconsistent, Inadequate
Surface Drainage Problems: Profile	DRAIN_PROB_PROFILE	1	TEXT, alphanumeric	Profile Y or N
Surface Drainage Problems: Rutting	DRAIN_PROB_RUT	1	TEXT, alphanumeric	Rutting Y or N
Surface Drainage Problems: Shoulders/Edge restraint too high	DRAIN_PROB_SHOULDER	1	TEXT, alphanumeric	Shoulders Y or N
Surface Drainage Problems: Side Drains	DRAIN_PROB_SIDE	1	TEXT, alphanumeric	Side Drains Y or N
Surface Drainage Problems: Failures/Depressions	DRAIN_PROB_FAIL	1	TEXT, alphanumeric	Failures/Depressions Y or N
Untraveled way (Unpaved shoulders)	UNPAVED_SHOULDER	1	TEXT, alphanumeric	N: None,

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				S: Safe, I: Inconsistent, U: Unsafe
Untraveled way (Unpaved shoulders) Problems: Erosion by water/traffic	UNPAVED__PROB__ERODED	1	TEXT, alphanumeric	Eroded Y or N
Untraveled way (Unpaved shoulders) Problems: Wearing out by traffic	UNPAVED__PROB__WEARING	1	TEXT, alphanumeric	Wear Out Y or N
Untraveled way (Unpaved shoulders) Problems: Inclined – differences in level between edge of carriage way and shoulder	UNPAVED__PROB__INCLINED	1	TEXT, alphanumeric	Inclined Y or N
Untraveled way (Unpaved shoulders) Problems: Overgrown	UNPAVED__PROB__OGROWN	1	TEXT, alphanumeric	Overgrown Y or N
Untraveled way (Unpaved shoulders) Problems: Too high	UNPAVED__PROB__2HIGH	1	TEXT, alphanumeric	Too high Y or N
Untraveled way (Unpaved shoulders) Problems: Too narrow	UNPAVED__PROB__2NARROW	1	TEXT, alphanumeric	Too narrow Y or N
Overall Pavement Condition	OPC	1	INTEGER(1)	1: Very Good 2: Good 3: Moderate 4: Poor 5: Very Poor
Other Problems: Trees	OTHER_PROB_TREE	1	TEXT, alphanumeric	Trees Y or N
Other Problems: Moles	OTHER_PROB_MOLE	1	TEXT, alphanumeric	Moles Y or N
Other Problems: Mechanical Damage	OTHER_PROB_DAMAGE	1	TEXT, alphanumeric	Mechanical Damage Y or N
Comments	COMMENTS	100	TEXT, alphanumeric	

5.5 Unsurfaced Visual Condition Summary (.vcu extension)

See TMH 9 Part E for detailed specification on the visual condition for unsurfaced roads.

Table 16: Unsurfaced types

Code	Unsurfaced type
E	Earth road: An unpaved road in which the in situ material is directly travelled by vehicles.
G	Gravel road: An unpaved road in which an imported material has been placed to provide a riding surface for vehicles.
T	Track road

Table 17: Unsurfaced Visual Condition (.vcu)

Column Description	Column Heading	Length	DATA TYPE	Format
Road ID	ROAD_ID	12	TEXT, alphanumeric	Senders Unique Network Road Id The foreign id to which data is joined to in the network table
Lane Code	LANE_CODE	4	TEXT, alphanumeric	Lane Code representing both direction and lane position. (P1, P2, S1 etc.)
Start km	START_KM	6	DECIMAL(6,3)	Format is 999.99 The START_KM, END_KM must fall within the range of a record in the Road classification table where the SURF_TYPE is indicated as concrete (CJP, DJP, CRC, UTCP)
End km	END_KM	6	DECIMAL(6,3)	Format is 999.99 The START_KM, END_KM must fall within the range of a record in the Road classification table where the SURF_TYPE is indicated as concrete (CJP, DJP, CRC, UTCP)
Road Authority Owner/Authority Same as in Classification table	OWNER	6	TEXT, alphanumeric	SANRAL (National) Provincial Municipality (Local)
Terrain Classification Same as in Classification table	TERR_CLASS	1	TEXT, alphanumeric	Format is 'A' 'F' for a Flat terrain, 'R' for a Rolling terrain 'M' for a mountainous terrain
Gradient	GRADIENT	1	TEXT, alphanumeric	F: Flat M: Medium

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				S: Steep
Road Width	ROAD_WIDTH	4	DECIMAL(4,2)	Width of paved surface. Gravel roads from shoulder breakpoint to shoulder break point.
Date of measurement	MEASURE_DATE	13	DATE/TIME	YYYYMMDD HH24:MI:SI
Visual Condition Index (VCI)	VCI	4	DECIMAL(4,1)	Format is 999.9
Reseal Condition Index (RCI)	RCI	4	DECIMAL(4,1)	Format is 999.9
Maintenance Need Index (MNI)	MNI	4	DECIMAL(4,1)	Format is 999.9
Surface Condition Index (SCI)	SCI	4	DECIMAL(4,1)	Format is 999.9
Structural Condition Index (STCI)	STCI	4	DECIMAL(4,1)	Format is 999.9
Functional Condition Index (FCI)	FCI	4	DECIMAL(4,1)	Format is 999.9
Crack Condition Index (CCI)	CCI	4	DECIMAL(4,1)	Format is 999.9
Road Type	ROAD_TYPE	1	TEXT, alphanumeric	E Earth: An unpaved road in which the in situ material is directly travelled by vehicles. G Gravel: An unpaved road in which an imported material has been placed to provide a riding surface for vehicles. T Track:
Moisture Condition	MOISTURE	1	TEXT, alphanumeric	W wet, M moist (damp) or D dry
Engineering Assessment (Material Properties)				
Gravel Quality	GRAVEL_QUALITY	1	INTEGER(1)	1: Very Good 2: Good 3: Moderate 4: Poor 5: Very Poor
Gravel Quality Influencing Factors: Excessive oversized stones and/or loose gravel	GQUAL_OVERSIZE	1	TEXT, alphanumeric	Y or N
Gravel Quality Influencing Factors: Excessive clay and/or silt (i.e. plasticity too high)	GQUAL_CLAY	1	TEXT, alphanumeric	Y or N
Gravel Quality Influencing Factors: Excessive loose gravel or sand – loose with insufficient fines (i.e. plasticity too low)	GQUAL_LOOSE	1	TEXT, alphanumeric	Y or N
Maximum size	MAX_SIZE	1	INTEGER(1)	1: > 50mm, 2: 25 – 50mm,

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				3: 13 – 25mm, and 4: < 13mm.
Grading	GRADING	1	TEXT, alphanumeric	C coarse, M medium or F fine
Plasticity	PLASTICITY	1	TEXT, alphanumeric	L Low Non-cohesive (sandy) M Medium Intermediate cohesion H High Cohesive (clayey)
Gravel Quantity: Layer thickness	GRAVEL_QUANTI TY	1	INTEGER(1)	1: >125 mm 2: 100mm – 125mm 3: 50mm – 100mm 4: 25mm – 50mm 5: 0mm
Exposed Subgrade	EXPOSED_SUBG RADE	1	TEXT, alphanumeric	N None I Isolated F Frequent C Continuous
Subgrade Quality	SUBGRADE_QUA LITY	1	TEXT, alphanumeric	G Good M Moderate P Poor
Engineering Assessment (Surface Distress)				
Potholes Degree	POTHOLES_DEG	1	INTEGER(1)	1-5
Potholes Extent	POTHOLES_EXT	1	INTEGER(1)	1-5
Corrugations Degree	CORRUGATIONS _DEG	1	INTEGER(1)	1-5
Corrugations Extent	CORRUGATIONS _EXT	1	INTEGER(1)	1-5
Rutting Degree	RUTTING_DEG	1	INTEGER(1)	1-5
Rutting Extent	RUTTING_EXT	1	INTEGER(1)	1-5
Loose Material Degree	LOOSE_MATERI AL_DEG	1	INTEGER(1)	1-5
Loose Material Extent	LOOSE_MATERI AL_EXT	1	INTEGER(1)	1-5
Stoniness fixed (embedded) Degree	STONINESS_FIX _DEG	1	INTEGER(1)	1-5
Stoniness fixed (embedded) Extent	STONINESS_FIX _EXT	1	INTEGER(1)	1-5
Stoniness loose Degree	STONINESS_LO OSE_DEG	1	INTEGER(1)	1-5
Stoniness loose Extent	STONINESS_LO OSE_EXT	1	INTEGER(1)	1-5

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Erosion Longitudinal Degree	EROSION_LONG_DEG	1	INTEGER(1)	1-5
Erosion Longitudinal Extent	EROSION_LONG_EXT	1	INTEGER(1)	1-5
Erosion Transverse (or Diagonal) Degree	EROSION_TRANS_DEG	1	INTEGER(1)	1-5
Erosion Transverse (or Diagonal) Extent	EROSION_TRANS_EXT	1	INTEGER(1)	1-5
Functional Assessment				
Roughness (Riding quality) Degree	RIDING_QUAL_DEG	1	INTEGER(1)	1: Very Good 2: Good 3: Moderate 4: Poor 5: Very Poor
Roughness (Riding quality) Problems: Deformation	RQUAL_PROB_DEFORM	1	TEXT, alphanumeric	Deformation Y or N
Roughness (Riding quality) Problems: Potholes	RQUAL_PROB_HOLE	1	TEXT, alphanumeric	HOLE Potholes Y or N
Roughness (Riding quality) Problems: Stoniness	RQUAL_PROB_STONINESS	1	TEXT, alphanumeric	Stoniness Y or N
Roughness (Riding quality) Problems: Rock Outcrop	RQUAL_PROB_ROCKS	1	TEXT, alphanumeric	Rock Outcrop Y or N
Roughness (Riding quality) Problems: Corrugations	RQUAL_PROB_CORR	1	TEXT, alphanumeric	CORR Corrugations Y or N
Roughness (Riding quality) Problems: Ruts	RQUAL_PROB_RUTS	1	TEXT, alphanumeric	Ruts Y or N
Roughness (Riding quality) Problems: Erosion	RQUAL_PROB_EROSION	1	TEXT, alphanumeric	Erosion Y or N
Trafficability/passability Degree	TRAFFICABILITY_DEG	1	INTEGER(1)	1-5
Trafficability/passability Problems: Steep Grades	TRAFFIC_PROB_STEEP	1	TEXT, alphanumeric	Y or N
Trafficability/passability Problems: Rocky Terrain	TRAFFIC_PROB_ROCKY	1	TEXT, alphanumeric	Y or N
Trafficability/passability Problems: Vegetation Encroachment	TRAFFIC_PROB_VEGETATION	1	TEXT, alphanumeric	Y or N
Trafficability/passability Problems: Insufficient cross drainage provision/ dangerous drifts/ wash-aways	TRAFFIC_PROB_DRAINAGE	1	TEXT, alphanumeric	Y or N

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Safety				
Safety Degree	SAFETY_DEG	1	INTEGER(1)	1: Very Good 2: Good 3: Moderate 4: Poor 5: Very Poor
Safety Problems: Dust	SAFETY_PROB_DUST	1	TEXT, alphanumeric	Y or N
Safety Problems: Slipperiness	SAFETY_PROB_SLIP	1	TEXT, alphanumeric	Y or N
Safety Problems: Skid Resistance	SAFETY_PROB_SKID	1	TEXT, alphanumeric	Y or N
Safety problems due to poor drainage and wash-aways	SAFETY_PROB_DRAINAGE	1	TEXT, alphanumeric	Y or N
Transverse Profile	TRANSVERS_PROFILE	1	INTEGER(1)	1: Very Good 2: Good 3: Moderate 4: Poor 5: Very Poor
Profile Problems: Windrows	PROFILE_PROB_WINDROWS	1	TEXT, alphanumeric	Y or N
Profile Problems: Rutting	PROFILE_PROB_RUTTING	1	TEXT, alphanumeric	Y or N
Profile Problems: Road Shape	PROFILE_PROB_SHAPE	1	TEXT, alphanumeric	Y or N
Profile Problems: Road Level	PROFILE_PROB_LEVEL	1	TEXT, alphanumeric	Y or N
Drainage from the road (side of the road)	DRAINAGE_SIDE	13	TEXT, alphanumeric	1: Very Good 2: Good 3: Moderate 4: Poor 5: Very Poor
Drainage Problems: Culvert Inlets	DRAIN_PROB_CULVERTS	1	TEXT, alphanumeric	Y or N
Drainage Problems: Side Drains	DRAIN_PROB_SIDE	1	TEXT, alphanumeric	Y or N
Drainage Problems: Mitre Drains	DRAIN_PROB_MITRE	1	TEXT, alphanumeric	Y or N
Drainage Problems: Road Level	DRAIN_PROB_LEVEL	1	TEXT, alphanumeric	Y or N
Overall Pavement Condition	OPC	1	INTEGER(1)	1: Very Good

				2: Good 3: Moderate 4: Poor 5: Very Poor
Other Problems: Trees	OTHER_PROB_T REES	1	TEXT, alphanumeric	Trees Y or N
Other Problems: Moles	OTHER_PROB_M OLES	1	TEXT, alphanumeric	Moles Y or N
Other Problems: Mechanical Damage	OTHER_PROB_D AMAGE	1	TEXT, alphanumeric	Mechanical Damage Y or N
Comments	COMMENTS	100	TEXT, alphanumeric	

5.6 Combined Instrument Data File (.cid extension)

The combined condition file contains the following three measurement types of data;

Roughness, Rutting and Texture, in a single file format. For a single file submission all three measurement data types need to have been done at the same time and location as they share the Road Id, Lane Code, Start Km, End Km and measurement date.

Table 18: Combined Instrument Data (.cid)

Column Description	Column Heading	Length	DATA TYPE	Format
Road ID	ROAD_ID	12	TEXT, alphanumeric	Senders Unique Road Id
Lane Code	LANE_CODE	4	TEXT, alphanumeric	Lane Code representing both direction and lane position. (P1, P2, S1 etc.)
Start km	START_KM	6	DECIMAL(6,3)	Format is 999.999
End km	END_KM	6	DECIMAL(6,3)	Format is 999.999
Date of measurement	MEASURE_DATE	13	DATE/TIME	YYYYMMDD HH24:MI:SI
Avg. IRI Left Wheel path (m/km)	AVG_IRI_L	3	DECIMAL(3,1)	Format is 99.9
Avg. IRI Right Wheel path (m/km)	AVG_IRI_R	3	DECIMAL(3,1)	Format is 99.9
IRI Left Std. Dev.	IRI_L_STDV	3	DECIMAL(3,1)	Format is 99.9
IRI Right Std. Dev.	IRI_R_STDV	3	DECIMAL(3,1)	Format is 99.9
Avg. HRI	AVG_HRI	3	DECIMAL(3,1)	Format is 99.9
HRI Std. Dev.	HRI_STDV	3	DECIMAL(3,1)	Format is 99.9
Avg. Rut in Left Wheel path	AVG_RUT_L	4	DECIMAL(4,1)	Format is 999.9
Avg. Rut in right Wheel path	AVG_RUT_R	4	DECIMAL(4,1)	Format is 999.9
Rut Std. Dev. Left	RUT_L_STDV	4	DECIMAL(4,1)	Format is 999.9

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Rut Std. Dev. Right	RUT_R_STDV	4	DECIMAL(4,1)	Format is 999.9
Avg. MPD Left Wheel path	AVG_MPD_L	3	DECIMAL(3,2)	Format is 9.99
Avg. MPD Centre	AVG_MPD_C	3	DECIMAL(3,2)	Format is 9.99
Avg. MPD Right Wheel path	AVG_MPD_R	3	DECIMAL(3,2)	Format is 9.99
MPD Std. Dev. Left	MPD_STDV_L	3	DECIMAL(3,2)	Format is 9.99
MPD Std. Dev. Centre	MPD_STDV_C	3	DECIMAL(3,2)	Format is 9.99
MPD Std. Dev. Right	MPD_STDV_R	3	DECIMAL(3,2)	Format is 9.99
Start Longitude	START_LONGITUDE	12	DECIMAL(12,9)	Longitude Value in Decimal Degrees World Geodetic System of 1984 (WGS84)
Start Latitude	START_LATITUDE	12	DECIMAL(12,9)	Latitude Value in Decimal Degrees World Geodetic System of 1984 (WGS84)

Data example:

```
MR00233;P1;3.60;3.70;20100401;15:32;4.5;4.1;0.5;0.6; 3.2;0.4;
12.1;15.3;1.2;2.1;0.73;;0.82;0.3;;0.4;-25.927733;27.902582 (CR) (LF)
```

5.7 Normalised Deflection Bowl Data (.fwd extension)

Table 19: Normalized deflection bowl data (.fwd)

Column Description	Column Heading	Length	DATA TYPE	Format
Road ID	ROAD_ID	12	TEXT, alphanumeric	Senders Unique Road Id
Lane Code	LANE_CODE	4	TEXT, alphanumeric	Lane Code representing both direction and lane position. (P1, P2, S1 etc.)
Survey Point (km)	SURVEY_KM	6	DECIMAL(6,3)	Format is 999.999
Measurement Date	DATE	10	DATE	YYYYMMDD HH24:MI:SI
Air Temperature at time of measurement (Degrees Celsius)	TEMP_AIR	4	DECIMAL(3,2)	Format is 99.9, where the last digit represent one digit after the decimal
Surface Temperature at time of measurement (Degrees Celsius)	TEMP_SURFACE	3	DECIMAL(3,2)	Format is 99.9, where the last digit represent one digit after the decimal
Load applied to pavement (KN)	PEAK_LOAD	4	DECIMAL(4,2)	Format is 99.99
Drop Number	DROP_NUM	2	INTEGER(2)	Format 99
Deflection of pavement at load plate centre (D0)	DEF_0	4	INTEGER(4)	Format is 9999

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Deflection of pavement at 200mm from load plate centre (D200) (Nanometres)	DEF_200	4	INTEGER(4)	Format is 9999
Deflection of pavement at 300mm from load plate centre (D300) (Nanometres)	DEF_300	4	INTEGER(4)	Format is 9999
Deflection of pavement at 400mm from load plate centre (D400) (Nanometres)	DEF_400	4	INTEGER(4)	Format is 9999
Deflection of pavement at 450mm from load plate centre (D450) (Nanometres)	DEF_450	4	INTEGER(4)	Format is 9999
Deflection of pavement at 500mm from load plate centre (D500) (Nanometres)	DEF_500	4	INTEGER(4)	Format is 9999
Deflection of pavement at 600mm from load plate centre (D600) (Nanometres)	DEF_600	4	INTEGER(4)	Format is 9999
Deflection of pavement at 750mm from load plate centre (D750) (Nanometres)	DEF_750	4	INTEGER(4)	Format is 9999
Deflection of pavement at 900mm from load plate centre (D900) (Nanometres)	DEF_900	4	INTEGER(4)	Format is 9999
Deflection of pavement at 1200mm from load plate centre (D1200) (Nanometres)	DEF_1200	4	INTEGER(4)	Format is 9999
Deflection of pavement at 1500mm from load plate centre (D1500) (Nanometres)	DEF_1500	4	INTEGER(4)	Format is 9999
Deflection of pavement at 1800mm from load plate centre (D1800) (Nanometres)	DEF_1800	4	INTEGER(4)	Format is 9999
Deflection of pavement at 2100mm from load plate centre (D2100) (Nanometres)	DEF_2100	4	INTEGER(4)	Format is 9999
Pulse Time milliseconds	PULSE_DURATION	4	DECIMAL(4,2)	Format 99.99
Base Layer Index (BLI=D0-D300) is an indication of the base course performance	BLI	4	INTEGER(4)	Format is 9999
Middle Layer Index (MLI = D300-D600) is an indication of the sub base performance	MLI	4	INTEGER(4)	Format is 9999
Lower Layer Index (LLI=D600-D900) is an indication of the subgrade performance	LLI	4	INTEGER(4)	Format is 9999

Start Longitude	START_LONGITUDE	12	DECIMAL(12,9)	Longitude Value in Decimal Degrees World Geodetic System of 1984 (WGS84)
Start Latitude	START_LATITUDE	12	DECIMAL(12,9)	Latitude Value in Decimal Degrees World Geodetic System of 1984 (WGS84)

Deflection bowl measurements were taken starting at survey point 56.7 km on single carriageway Main Road 310 on 21 March 2011 at 14:03. The air temperature was 22.8°C, the pavement surface temperature was 52.4°C, the asphalt temperature was 63.1°C, and the load applied to the pavement was 40 kN:

D0 1120 nanometres
 D200 980 nanometres
 D300 701 nanometres
 D400 Not Measured
 D450 Not Measured
 D500 Not Measured
 D600 564 nanometres
 D750 Not Measured
 D900 356 nanometres
 D1200 103 nanometres
 D1500 80 nanometres
 D1800 Not Measured
 D2100 Not Measured
 Pulse Time 30.05ms
 BLI 419
 MLI 137
 LLI 208

This data should be presented as please note that line endings are shown with (CR)(LF) as the document width could not accommodate the data length:

```
R30301N;MR00310;P1;56.70;20110321;14:03;22.8;52.4;63.1;40;2;1120;980;701;;;564;
; 356;103;80;;;30.05;419;137;208; -25.927733;27.902582 (CR) (LF)
```

5.8 FWD F25 files (.f25 extension)

F25 files are an internationally accepted raw format for FWD data. The files contain all the information of an FWD survey. The file format is ASCII but with an .f25 extension.

F25 File Example:

```

5001,25.08,1,40, 3, 1,"FwdWin      "
5002,"25SIN    ","8002-165","CP15-416"
5003,"Administ","NRA (2x4","SRT      ","F25"
5010,0,0,0,0,0,0,0,3,1,0,0,0,0,0,1,0,0,0,0,0,1,"MDB"
5011,0,1,2012,07,11,02,37,0,"Non",000
5200,"525      ",2,0.998, 91.6, -0.24,  1.667
5201,"4671     ",4,0.995,1.038
5202,"4672     ",4,1.000,1.011
5203,"4673     ",4,1.002,1.010
5204,"7566     ",4,1.001,1.029
5205,"4675     ",4,1.002,1.051
5206,"4676     ",4,1.006,0.992
5207,"4677     ",4,1.005,0.982
5208,"4678     ",4,1.002,1.008
5209,"4679     ",4,1.009,1.023
5210,"7567     ",4,1.004,0.999
5211,"4674     ",4,1.005,1.032
5212,"NA       ",4,0.000,0.000
5213,"NA       ",4,0.000,0.000
5214,"NA       ",4,0.000,0.000
5215,"NA       ",4,0.000,0.000
5216,"NA       ",4,0.000,0.000
5217,"NA       ",4,0.000,0.000
5218,"NA       ",4,0.000,0.000
5020, 150,    0,  200,  300,  400,  500,  600,  750,  900, 1200, 1500,
1800,NO      ,NO      ,NO      ,NO      ,NO      ,NO      ,NO
5021,  300,    0,    0,    0,    0,    0,    0,    0,    0,    0,NO
,NO      ,NO      ,NO      ,NO      ,NO      ,NO      ,NO
5022,1,   0,   0,   50, 100, 200, 390,"L123456789"
5023,1,3,0,   0.000, 13.000, 13.000,  0.000,  0.000,1,1
5024,1,0,0,1,3,3,   5, 2.0,   2, 2.0,1,0,0, 60

```


COTO Standard for Road Network Data

```

5029,      1,      393,      1,      393
5030,"Administrator"
5031,"N3"
5032,"
5301,0,0,0,3,  0.000,0,0,1      ,2012,07,11,02,36,0,0000
5302,0,0,0,0,0,0,0,0,0,"
5303,  0.0, 25.0, 23.0
5041,""
5042,""
5043,""
5044,""
5280,0,102119.2,-26.2932850,  28.1559567,1561.7, 2, 7,  0,  0
5301,0,0,0,3,  13.000,0,0,1      ,2012,07,11,12,21,0,0000
5302,0,0,0,0,0,0,0,0,0,"
5303,0,  0.0, 25.1, 22.3
      1,  563, 494.6, 383.6, 306.6, 237.9, 192.5, 138.0,  89.6,  57.7,  29.0,  20.1,
16.3,  28.050
      2,  595, 481.7, 375.5, 301.2, 235.2, 191.2, 138.2,  90.8,  59.1,  30.4,  21.3,
16.2,  28.900
      3,  714, 564.8, 452.2, 350.2, 283.1, 233.6, 170.9, 109.3,  79.4,  39.0,  26.9,
21.7,  27.550
5280,0,102224.4,-26.2940650,  28.1564517,1557.2, 2, 8,  0,  0
5301,0,0,0,3,  12.900,0,0,1      ,2012,07,11,12,22,0,0000
5302,0,0,0,0,0,0,0,0,0,"
5303,0,  0.0, 25.1, 22.2
      1,  568, 396.0, 331.9, 279.2, 228.1, 190.2, 139.2,  95.7,  63.1,  31.9,  18.3,
6.5,  27.850
      2,  573, 391.5, 330.0, 276.2, 226.8, 188.8, 139.4,  95.0,  64.0,  31.0,  18.5,
6.7,  28.150
      3,  711, 458.2, 387.8, 326.6, 269.9, 227.0, 168.5, 118.0,  79.4,  39.7,  23.9,
10.7,  27.450
5280,0,102321.4,-26.2945683,  28.1568317,1554.3, 2, 8,  0,  0
5301,0,0,0,3,  12.800,0,0,1      ,2012,07,11,12,23,0,0000
5302,0,0,0,0,0,0,0,0,0,"
5303,0,  0.0, 25.1, 22.3
      1,  572, 348.6, 284.4, 234.7, 193.0, 157.2, 119.1,  83.2,  52.5,  25.4,  16.2,
4.3,  27.900
      2,  567, 340.2, 278.7, 230.0, 189.5, 155.8, 117.5,  86.6,  52.0,  25.4,  15.4,
4.0,  28.150

```

```
3, 713, 399.8, 331.3, 274.7, 227.1, 186.1, 143.6, 99.5, 65.0, 34.2, 22.2,  
7.1, 27.400
```

Every line starting with a 5 contains different information. Programs like Rubicon or Elsym can read these files in their raw format to use in analyses.

An explanation of the meaning of the data are contained in Appendix A.

6 Structure Data Submission Types

This section will be updated as soon as issues related the different look-ups that exist for maintenance activities in Struman Software is resolved

References

DRAFT

7 APPENDIX A: F25 FILE FORMAT

7.1 EXAMPLE F25 UPLOAD FILE FORMAT AND LISTING

7.1.1 Introduction

The output file with the file name extension F25 contains the header information and peak load and deflection data in ASCII format. This file typically contains 46 lines of "header" information followed by test data and/or comments. Each line or record is prefixed by a four digit "Line-ID-Number" (LIN) or object field, which identifies its format and content. Data elements on a line are stored in a fixed column, comma separated, format. Most of the text fields are enclosed in double quotes. This text data is stored as entered by the operator with leading and trailing spaces in some cases. Numbers are right justified.

In this appendix, a detailed, annotated, description of the format and contents of the F25 upload file is presented.

7.1.2 Annotated Description of F25 FWD Upload File Format

In the following format and content descriptions of the F25 upload file, fields on each data line are specified using an [X, Y] column designation, where X is the begin column and Y the end column, since the data are placed in fixed column width locations. Each line of data in the file is prefixed with a Line ID Number (LIN), which serves as an object field, in columns [1,4]. This LIN is used to describe the contents of each line. Also used in the description of the header portion of file is the sequential line number in which each LIN appears in a typical file.

7.1.3 Header Data

Typically, the first 46 lines of data in the F25 FWD data file, contains header data.

The number of lines of header data in the file is shown in columns 14 and 15 in the first line of the data file.

7.1.3.1 Program Version - LIN 5001

```
5001,25.11,1,46, 4, 1,"Aug 2000 "  
[ 6, 7] 25 Program Edition  
[ 8, 10] .11 Program Edition Version  
[ 12, 12] 1 No of Headers (always 1)  
[ 14, 15] 46 No of Lines in Header  
[ 17, 18] 4 Lines per Station Id  
[ 20, 21] 1 Lines per Drop  
[ 24, 39] Aug 2000 Program Comment
```

7.1.3.2 Primary "Files" - LIN 5002

```
5002,"25SIN ","8002-061","9000-323"  
[ 7, 14] 25SIN Data Format Setup File - 25SIN (SI units with Numeric
```

```
Stations)
[ 18, 25] 8002-061 Trailer ID
[ 29, 36] 9000-323 Processor ID
```

7.1.3.3 Secondary “Files” - LIN 5003

```
5003,“OPERATOR”,“3-RGD_LT”
[ 7, 14] OPERATOR Operator File
[ 18, 25] 3-RGD_LT TSU - Test Setup File - Used to determine drop number and
drop height sequence
```

7.1.3.4 Units & History option - LIN 5010

```
5010,0,0,0,0,0,0,0,0,5,1,0,0,0,0,0,1,0,0,0,0,0,1,“H25”
[ 6, 6] 0 Temperature - 0=deg C, 1=deg F;
[ 8, 8] 0 Spare
[ 10, 10] 0 Weight(Mass) - 0=Kg, 1=lb;
[ 12, 12] 0 Spare
[ 14, 14] 0 Deflection - 0=microns, 1=milli-inches;
[ 16, 16] 0 Distance - 0=mm, 1=inch;
[ 18, 18] 0 Spare
[ 20, 20] 5 Location 2=Meters ;
3=km
4=km extended
5=Feet
6=Yards
7=Miles
8=Miles extended
9=Miles.feet
[ 22, 22] 1 Geographic angle;
[ 24, 24] 0 Force - 0=kN, 1=lb;
[ 26, 26] 0 Pressure - 0=kPa, 1=psi;
[ 28, 28] 0 Heavy Pressure;
[ 30, 30] 0 Spare
[ 32, 32] 0 Spare
[ 34, 34] 1 Angle (Rad, Deg);
[ 36, 36] 0 Spare
[ 38, 38] 0 Spare
[ 40, 40] 0 Spare
[ 42, 42] 0 Spare
[ 44, 44] 0 Spare
[ 46, 46] 1 History Mode, 0=ASCII 1=BINARY (separate file);
[ 49, 51] H25 History File Extension;
```

7.1.3.5 Date and Time

```
5011,0,1,1999,11,08,17,32,1,“Mon”,312
[ 6, 6] 0 Date
[ 8, 8] 1 Time
[ 10, 20] 1999,11,08 Test Date
[ 11, 14] 1999 Year
[ 16, 17] 11 Month
```

```
[ 19, 20] 08 Day
[ 22, 26] 17,32 Time;
[ 22, 23] 17 Hour;
[ 25, 26] 32 Minute;
[ 28, 28] 1 Day of week (0=Sun);
[ 31, 33] Mon Literal Day of week;
[ 36, 38] 312 Julian Day (1=Jan 1);
```

7.1.3.6 Load Cell - LIN 5200

```
5200,"F0201 ",2,0.980, 87.6, -0.72, 7.229
[ 7, 8] F0 First two Characters Load Cell File Name;
[ 9, 11] 201 Load Cell Serial Number
[ 12, 14] Remaining Characters in load Cell File Name;
[ 17, 17] 2 Type
[ 19, 23] 0.980 Relative Gain
[ 25, 29] 87.6 Absolute Gain
[ 31, 36] -0.72 Unbalanced Zero;
[ 38, 44] 7.229 Shunt Value;
```

7.1.3.7 Deflection Sensors - LIN 5201 - 5218

```
5201,"2181 ",4,0.998,1.014
[ 1, 4] 5201 LIN Number - Representing Sensor Number
[ 1, 2] 52 First two Digits of LIN
[ 3, 4] 01 Sensor Number
[ 7, 14] 2181 Deflection Sensor File Name, Deflection Sensor Serial Number (Equal to NA if Sensor Not Active.)
[ 17, 17] 4 Type;
[ 19, 23] 0.998 Relative Gain
[ 25, 29] 1.014 Absolute Gain
LIN 5202...5218 (lines 8..24) same format as LIN 5201
25. Load Plate Radius and X Positions of Deflection Sensors - LIN 5020
5020, 150, 0, 200, 300, 450, 600, 900, 1200, 1500, 1800,NO ,..
[ 6, 11] 150 Load Plate Radius
[ 13, 18] 0 X-Position Sensor 1
[ 20, 25] 203 X-Position Sensor 2
[ 27, 32] 305 X-Position Sensor 3
[ 34, 39] 457 X-Position Sensor 4
...
[132,137] NO X-Position Sensor 18 - NO - Not Active;
```

7.1.3.8 Load Plate Diameter of Plate and Y-Positions of Deflection Sensors - LIN 5021

```
5021, 300, 0, 0, 0, 0, 0, 0, 0, 0,NO ,..
[ 6, 11] 300 Load Plate Diameter;
[ 13, 18] 0 Y - Position of Sensor 1;
[ 20, 25] 0 Y - Position of Sensor 2;
[ 27, 32] 0 Y - Position of Sensor 3;
..
[132,137] NO Y - Position of Sensor 18 - NO - Not Active;
```

7.1.3.9 “Other” Physicals - LIN 5022

```

5022,0, 200, 192, 50, 100, 200, 390
[ 6, 6] 0 Plate Type: 0=Standard 1=Split Plate;
[ 8, 11] 200 Loading Mass;
[ 13, 16] 192 Mass (sensed);
[ 18, 22] 50 Load Height ONE;
[ 24, 28] 100 Load Height TWO;
[ 30, 34] 200 Load Height THREE;
[ 36, 40] 390 Load Height FOUR;

```

7.1.3.10 Station and Lane Information - LIN 5023

```

5023,1,3,2, 8, 481, 481, 1, 328,1,1
[ 6, 6] 1 Station is: 0=Alpha 1=Numeric;
[ 8, 8] 3 Numeric Station is: 1=Real, 2=Location, 3=DMI, 4=DMI Rounded;
[ 10, 10] 2 Step Mode: 0=None, 1=Fixed, 2=Logical;
[ 12, 19] 8 Min Station;
[ 21, 28] 481 Max Station;
[ 30, 37] 481 Previous Station;
[ 39, 46] 1 Station Step;
[ 48, 55] 328 DMI Rounding;
[ 57, 57] 1 Lane is: 0=Alpha 1=Numeric;
[ 59, 59] 1 Numeric Lane is: 1=Real 2=Location;

```

7.1.3.11 Test Setup Options - LIN 5024

```

5024,0,0,0,1,0,1, 3, 2.0, 2, 3.0,0,0,0, 120
[ 6, 6] 0 Station Prompt;
[ 8, 8] 0 Temperature Prompt(s);
[ 10, 10] 0 Condition Prompt;
[ 12, 12] 1 Reject Prompt;
[ 14, 14] 0 Decrease Check;
[ 16, 16] 1 Roll Off Check;
[ 18, 23] 3 Pressure Variation;
[ 25, 28] 2.0 Pressure Variation %;
[ 30, 35] 2 Deflection Variation;
[ 37, 40] 3.0 Deflection Variation %;
[ 42, 42] 0 Temperatures "Keep";
[ 44, 44] 0 Smoothing
[ 46, 46] 0 History Smoothing,
[ 48, 51] 120 Cut off (Hz),

```

7.1.3.12 No of Sequences, Drops total - LIN 5029

```

5029, 20, 240, 134, 2579
[ 6, 13] 20 Sequences stored in file;
[ 15, 22] 240 Drops stored in file;
[ 24, 31] 134 Total No Sequences Run by Program with this Rig;
[ 33, 40] 2579 Total No Drops Run by Program with this Rig;

```

7.1.3.13 Operator Name - LIN 5030

```
5030,"Mike Esposito "
[ 7, 38] Mike Espos.. Operators Name
```

7.1.3.14 RoadID LIN 5031

```
5031,"N000102N"
[ 7, 14] N000102N - SANRAL Road ID;
```

7.1.3.15 RoadID Description - LIN 5032

```
5032,"Klipriver to Worcester"
[ 7, 51] Klipriver to W... RoadID Description
36. Station Id for NUMERIC type Station and Lane - LIN 5301
5301,2,1,3,5, 15.400,1,1, 0.000,1999,11,08,17,32
[ 6, 6] 2 Side of Road
[ 8, 8] 1 Station
[ 10, 10] 3 Numeric Station
[ 12, 12] 5 Location
[ 14, 21] 15 Station
[ 23, 23] 1 Alpha/Numeric Lane
[ 25, 25] 1 Numeric Lane
[ 27, 34] 0.000 Lane
[ 36, 45] 1999,11,08 Date
[ 36, 39] 1999 Year
[ 41, 42] 11 Month
[ 44, 45] 08 Day
[ 47, 51] 17,32 Time
[ 47, 48] 17 Hour
[ 50, 51] 32 Minute
```

7.1.3.16 Comment Codes - LIN 5302

```
5302,0,1,8,2,0,0,0,0
[ 6, 6] 0 Weather
[ 8, 8] 1 Sunlight
[ 10, 10] 8 Pavement
[ 12, 12] 2 Cracks
[ 14, 14] 0 E
[ 16, 16] 0 F
[ 18, 18] 0 G
[ 20, 20] 0 H
38. Temperatures - LIN 5303
5303,0, 0.0, 16.7, 18.3
[ 6, 6] 0 Temperature Units Code: 0= Deg C, 1= Deg F
[ 8, 12] 0.0 Asphalt
[ 14, 18] 16.7 Pavement Surface
[ 20, 24] 18.3 Air
39. Comment 1 - LIN 5041
```



```

5041," "
[ 7, 51] Comment 1,
44. Comment 2 - LIN 5042
5042," "
[ 7, 51] Comment 2,
45. Comment 3 - LIN 5043
5043," "
[ 7, 82] Operator Comment 3,
46. Comment 4 - LIN 5044
5044," "
[7, 82] Operator Comment 4,

```

7.1.4 Test Data

In the test data portion of the file, test data are stored in chronological order in repeating data blocks which contain measurements at each test point or station. The number of data lines in each data group varies depending on the test setup. The test data are arranged in the following groups:

Station Information - LIN 5301, 5302, and 5303

FWD Peak Load and Deflection Measurements

Station Information

The first line of station information data always has a LIN of 5280. This Line contains the GPS Location Information.

```

5280,0, 82337,-34.2256667, +19.1877283, 173.9, 4, 7, 100,8
[ 6, 6] 0: No of Failure;
1= Too Few Satellites
2= DOPS too Large
3= Position STD too large
4= Velocity STD too large
5= Too many iterations for velocity
6= Too many iterations for position
7= 3 sat startup failed
8= Initial Acq.
9= Timeout
[ 8, 13] 82337 UTC Time (Seconds into the week);
[ 15, 25] -34.2256667 GPS Latitude in degrees (real);
[ 27, 38] +19.1877283 GPS Longitude in degrees (real);
[ 40, 45] 173.9 GPS Elevation in Meters;
[ 47, 48] 4 PDOP (Position Dilution of Precision)
[ 50, 52] 7 Number of Satellites Visible;
[ 54, 57] 100 Signal strength
[ 59, 63] 8 - HDOP (Horizontal Dilution of Precision)
LIN 5301 Station Id for NUMERIC type Station and Lane -
5301,2,1,3,2, 15.200,1,1, 0.000,1999,11,08,16,24
[ 6, 6] 2 Side of Road;
[ 8, 8] 1 Station is: 0=Alpha 1=Numeric;
[ 10, 10] 3 Numeric Station is: 1=Real, 2=Location, 3=DMI, 4=DMI Rounded;
[ 12, 12] 3 Location 2=Meters ;

```

```

3=km
4=km extended
5=Feet
6=Yards
7=Miles
8=Miles extended
9=Miles.feet
[ 14, 21] 15.200 Station
[ 23, 23] 1 Alpha/Numeric Lane, 0=Alpha 1=Numeric;
[ 25, 25] 1 Numeric Lane, 1=Real 2=Location;
[ 27, 34] 0.000 Lane;
[ 36, 45] 1999,11,08 Date,
[ 36, 39] 1999 Year
[ 41, 42] 11 Month
[ 44, 45] 08 Day
[ 47, 51] 16,24 Time,
[ 47, 48] 16 Hour, 00 - 24
[ 50, 51] 24 Minute, 00-59
LIN 5302 Comment Codes - LIN 5302
5302,0,1,0,2,0,0,0,0
[ 6, 6] 0 Weather Code;
0= Sunny
1= Cloudy
2= Rainy
[ 8, 8] 1 Sunlight Code;
0= Day time
1= Night time
[ 10, 10] 0 Vertical Alignment Code;
0= Normal
1= Cut
2= Fill
[ 12, 12] 2 Cracks Code;
0= None
1= Moderate
2= Severe
[ 14, 14] 0 E;
[ 16, 16] 0 F;
[ 18, 18] 0 G;
[ 20, 20] 0 H;
LIN 5303 Temperatures - LIN 5303
5303,0, 0.0, 20.2, 21.7
[ 6, 6] 0 Temperature Units Code: 0= Deg C, 1= Deg F;
[ 8, 12] 0.0 Asphalt;
[ 14, 18] 20.2 Pavement Surface Temperature
[20, 24] 21.7 Air Temperature,

```

7.1.5 FWD Peak Load and Deflection Measurements

The lines which contain FWD peak load and deflection values use the LIN object field as a sequence step number. Its value corresponds to the drop number in the load sequence at the test location. For most data, the LIN will start with 2, since 1 seating drop are performed prior to recording the deflection and load measurements. The following example data are 2

repeat drops from one drop height and then one drop from a different height. The Peak load duration is added at the end of every line and is in milliseconds to 3 decimal places.

```
2, 572, 209, 194, 179, 159, 140, 109, 85, 68, 42, 27.321
3, 575, 210, 195, 181, 160, 141, 110, 86, 68, 43, 27.364
4, 771, 276, 258, 239, 210, 185, 144, 111, 90, 56, 28.354
.
.
.
[ 1, 4] 2 Sequence Step No is LIN,
[ 6, 11] 572 Peak Load (pressure) (kPa),
[ 13, 18] 209 Peak Deflection Sensor 1, microns,
[ 20, 25] 194 Peak Deflection Sensor 2, microns,
[ 27, 32] 179 Peak Deflection Sensor 3, microns,
[ 34, 39] 159 Peak Deflection Sensor 4, microns,
[ 41, 46] 140 Peak Deflection Sensor 5, microns,
[ 48, 53] 109 Peak Deflection Sensor 6, microns,
[ 55, 60] 85 Peak Deflection Sensor 7, microns,
[ 62, 67] 68 Peak Deflection Sensor 8, microns,
[ 69, 74] 42 Peak Deflection Sensor 9, microns,
[75, 82] Peak Load duration - in milliseconds.
```

Example Fwd *.F25 File

```
5001,25.12,1,40, 3, 1,"December 94 "
5002,"25SIN ","8002-165","9000-145"
5003,"SYSOP ","NRA98 "
5010,0,0,0,0,0,0,0,3,1,0,0,0,0,0,1,0,0,0,0,1,"H25"
5011,0,1,2001,10,13,10,29,6,"Sat",286
5200,"F0357 ",2,1.005, 88.1, -1.21, 7.220
5201,"2571 ",4,1.001,0.997
5202,"2572 ",4,0.998,1.025
5203,"2573 ",4,0.999,0.996
5204,"2574 ",4,0.998,1.001
5205,"2575 ",4,1.000,0.991
5206,"2576 ",4,0.999,0.998
5207,"2577 ",4,0.999,1.000
5208,"2578 ",4,0.995,1.041
5209,"3460 ",4,1.000,0.988
5210,"NA ",0,0.000,0.000
5211,"NA ",0,0.000,0.000
5212,"NA ",0,0.000,0.000
5213,"NA ",0,0.000,0.000
5214,"NA ",0,0.000,0.000
5215,"NA ",0,0.000,0.000
5216,"NA ",0,0.000,0.000
5217,"NA ",0,0.000,0.000
5218,"NA ",0,0.000,0.000
5020, 150, 0, 200, 300, 450, 600, 900, 1200, 1500, 1800
5021, 300, 0, 0, 0, 0, 0, 0, 0, 0, 0
5022,1, 200, 118, 70, 133, 216, 337
```

```

5023,1,3,0, 38.300, 43.000, 38.300, -0.100, 0.001,1,1
5024,1,1,1,1,3,3, 3, 2.0, 2, 1.0,0,0,0, 60
5029, 26, 78, 44787, 184997
5030,"Frank NICKOLS "
5031,"N000202W "
5032,"Houwhoek pass Start to Houwhoek pass End 200M INTERVALS "
5301,0,1,3,3, 38.300,1,1, 0.000,2001,10,13,10,29
5302,0,1,5,0,0,1,,," "
5303,0, 21.0, 21.0, 23.0
5041,"Previous test: "
5042,"Next Test(s): "
5043," "
5044," "
5280,0, 82337,-34.2256667, +19.1877283, 173.9, 4, 7, 100,8
5301,0,1,3,3, 42.700,1,1, 0.000,2001,10,13,09,58
5302,0,1,5,0,0,1,,," "
5303,0, 21.0, 21.0, 22.1
2, 617, 485, 360, 253, 162, 108, 55, 34, 23, 19, 27.244
3, 606, 479, 353, 248, 160, 110, 54, 35, 24, 16, 30.235
4, 745, 543, 400, 284, 187, 128, 65, 42, 29, 23, 27.267
5280,0, 95005,-31.8929933, +26.8502933,1117.3, 4, 6, 100,8
5301,0,1,3,3, 2.100,1,1, 0.000,2001,10,24,11,28
5302,0,1,5,0,0,1,,," "
5303,0, 33.0, 33.0, 28.4
2, 615, 501, 331, 201, 113, 73, 42, 30, 23, 18, 24.354
3, 615, 497, 329, 201, 113, 72, 42, 29, 24, 19, 28.234
4, 756, 559, 379, 236, 138, 91, 53, 37, 29, 13, 27.254

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