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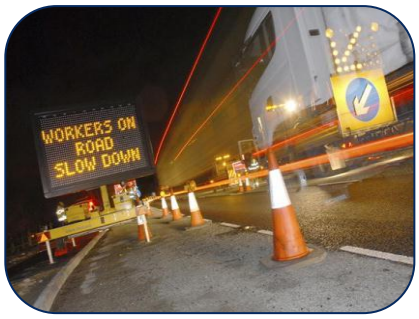


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Calculation of Local Equilibrium Correction Factors for the 2014 Skid resistance surveys

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Executive Summary

The Highways Agency manages levels of skid resistance on their network by carrying out single annual skid resistance surveys (SASS). These surveys are corrected for seasonal variation by the application of correction factors called the "Local Equilibrium Correction Factors" (LECF). The procedure used since 2007 to calculate the LECFs was used again during 2014. This document provides a record of the procedure used to derive the LECFs that have been applied to the 2014 skid resistance survey data.

A high percentage (98.1%) of the HA network was surveyed in 2014, with each HA Area having at least 96% coverage of survey data. In addition to the HA Areas, LECFs were provided for the A1 Darrington to Dishforth, A69, M25 and Second Severn Crossing DBFOs. These DBFOs had 100%, 96%, 99% and 100% coverage respectively.

Four of the HA Areas were surveyed outside of the target survey period. These were Area 3, Area 7, Area 12 and Area 14. The surveys for Area 12 and Area 14 ran over into the next survey period by one and two days respectively and will therefore have little impact on future LECF calculations.

Area 3 was surveyed in the first two weeks of the middle period (the target was the early period). Area 7 was surveyed in the middle of the middle period, the start of the late period and the end of the late period (the target was the middle period).

For the remaining Areas, the majority of the lane 1 surveys were conducted within or around 2 weeks. However, for two Areas (Area 1 and Area 4) the surveys took over 2 weeks to complete. On examination of the localities within these Areas (road and Area combination) it could be seen that for the majority of these localities the surveys took over 2 weeks to complete.

Surveys of lanes other than lane 1 are required under some DBFO contracts. This year additional surveys were conducted for the A69 and M25 DBFO. The A69 DBFO additional surveys were carried out in the same period as the lane 1 surveys and therefore had the lane 1 LECF applied. The M25 DBFO additional surveys were conducted in the middle period (the lane 1 surveys were in the late period) and therefore no LECFs were supplied for the additional surveys in the M25 DBFO.

Previous research by TRL identified that concrete did not appear to experience seasonal variation to the same degree as other surfacings. Therefore an LECF of 1.000 (i.e. no correction) was applied to concrete sections. An investigation into the application of LECFs on concrete sections using the 2014 data found no conflict with the previous investigations into concrete. Therefore due to the unsuitability of the calculated LECFs for concrete it is recommended that the application of an LECF of 1.000 for concrete sections is continued.

Analysis of the spread of 2014 LECF values suggests that the lowest levels of skid resistance were experienced towards the end of the middle period. This is not what would be expected (the low point should occur closer to the middle of this period), however it is quite likely that this is due to additional variation between years, and at this stage does not suggest that the survey periods are inappropriate.

The weighted average LECF value was 1.095 for 2014, showing that the skid resistance of the network was lower than the average of the previous three years.

1 Introduction

The Highways Agency (HA) manages the levels of skid resistance on its network by carrying out single annual skid resistance surveys (SASS). The test season for these surveys is broadly over the summer months, and is divided into three survey periods (early, middle and late). The network has been divided so that approximately a third of its length is tested in each survey period; the survey period rotates to ensure that each length of the network is tested once in each period over three years. Skid resistance levels vary during the course of the year with the lowest levels of skid resistance experienced in the middle of the summer. The general trend for skid resistance is shown diagrammatically in Figure 1.1.

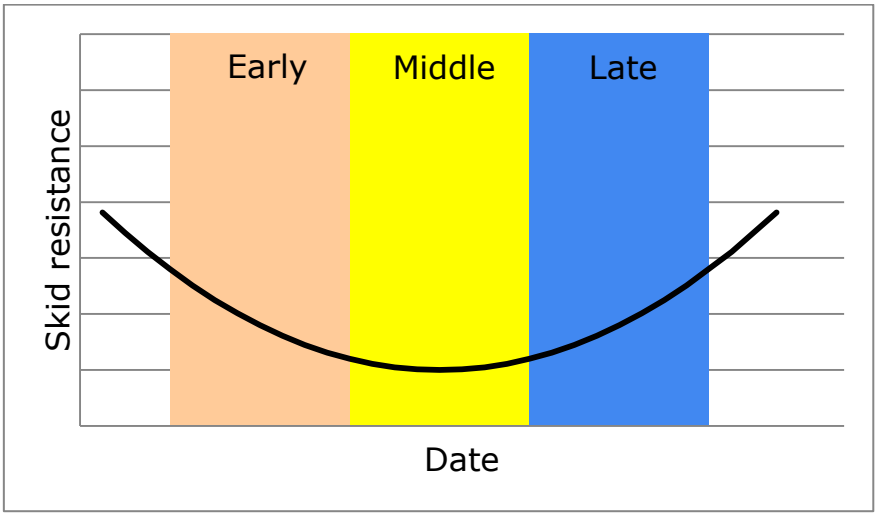

Figure 1.1 Idealised seasonal variation of skid resistance over the summer

In order to correct for this seasonal variation, Local Equilibrium Correction Factors (LECFs) are calculated which are then applied to the speed corrected skid resistance data (SC). Once this data has been seasonally corrected it is termed the Characteristic Skid Coefficient (CSC).

The network is split into "localities", consisting of the length of each road within a specified HA Maintenance Area, and a LECF value is assigned to each of these localities. The LECF is calculated from the average of the past three years' SC data (known as the Local Equilibrium SC or LESC) and the current average for the locality (known as the Local Mean SC or LMSC). For each locality two types of LECF are calculated. The first type, known as the road LECF is calculated using the data available for that locality only. The other LECF is called the Area LECF and uses all of the data available for the Area that contains the locality. The Area LECF uses data from surveys which can be spread over several weeks and are over a wide area. Since fluctuations in skid resistance can occur within this period of time, this generally means that the Area LECF is less robust than the road LECF. However, some localities are quite small and therefore have little data available for calculation of a robust road LECF. A minimum length is therefore applied for the calculation of a road LECF. If a locality has 25km or more of valid SC data then the road LECF is applied, otherwise the Area LECF is used. Full details of the LECF calculation procedure are given in Appendix A.

Once the LECF values have been calculated for each survey period, they are loaded into the Highways Agency Pavement Management System (HAPMS) so that they can be used in conjunction with the skid resistance survey data.

This document provides a record of the procedure used to derive the LECFs that have been applied to the 2014 skid resistance survey data.

The procedure developed in 2007 which incorporates a visual analysis and which was refined in 2008 to include an automated analysis (Brittain, 2009) was used again this year. A summary of the survey coverage and range of survey dates is given in section 2.1. Section 3 contains an overview of the calculation and delivery of the 2014 LECF values, along with any issues identified. Additional observations from the 2014 LECF calculation are discussed in Section 4 and Appendix B contains tables of the LECF values calculated.

2 Data quality

2.1 Survey Coverage

The survey coverage obtained for 2014 is presented in Table 2.1. A high percentage of the network survey was achieved this year (98.1% total coverage for HA Areas) with most HA Areas achieving 97% or more coverage. Four of the HA areas were not surveyed in the target survey period. The spread of survey dates is discussed further in section 2.3.

The A1 Darrington to Dishforth (A1DD), M25 DBFOs and Second Severn Crossing DBFO had 100%, 99% and 100% coverage respectively. This year also saw the loading of data into HAPMS for some other DBFOs; of these, only the A1(M) and A69 DBFOs had high levels of coverage with 100% and 96% respectively. All of the DBFOs with survey data loaded into HAPMS are discussed further in section 3.4.

Table 2.1 Survey coverage in 2014 (analysis run 21st January 2015)

Target survey period	Area	Percentage of Area surveyed (lane 1 not Ox Bow Lay-by)				
		Early	Middle	Late	Very Late[1]	Over survey year
Early	Area 3	-	99	-	-	99
	Area 9	96	-	-	-	96
	Area 13	97	-	-	-	97
	Area 14	90	10	-	-	100
Middle	Area 1	-	99	-	-	99
	Area 6	-	99	-	-	99
	Area 7	-	20	77	-	96
	Area 8	-	100	-	-	100
	Area 12	-	98	2	-	99
Late	Area 2	-	-	99	-	99
	Area 4	-	-	97	-	97
	Area 10	-	-	99	-	99
	M25 DBFO	-	-	99	-	99
	A1DD DBFO	-	-	100	-	100
	Second Severn Crossing	-	-	100	-	100
DBFOs with no defined survey rotation	A1M DBFO	100	100	100	-	100
	A249 DBFO	-	-	-	-	0
	A417/A419 DBFO	15	9	15	-	15
	A69 DBFO	-	-	96	-	96
n/a	HA Areas	n/a	n/a	n/a	n/a	98

[1] The very late surveys are any surveys conducted between the end of the survey season (20th October) and the end of the calendar year.

2.1.1 Survey load dates

The skid resistance survey contract states that survey data should be processed and loaded into HAPMS as soon as practicable and in any event within thirty days. The expected survey load dates (simplified here to one month after the end of the survey period) are given in Table 2.2. The percentage of the data loaded by these dates for each area is given in Table 2.3.

Table 2.2 Expected survey load dates

Survey period	End of survey season	Expected load by date
Early	27th June 2014	27th July 2014
Middle	24th August 2014	24th September 2014
Late	20th October 2014	20th November 2014

Table 2.3 Percentage of current data loaded by expected load dates (analysis run 21st January 2015)

Target survey period	Area	Percentage of current data loaded by expected survey load date
Early	Area 3	**0**
	Area 9	**81**
	Area 13	91
	Area 14	**0**
Middle	Area 1	100
	Area 6	100
	Area 7	99
	Area 8	100
	Area 12	100
Late	Area 2	100
	Area 4	100
	Area 10	100
	M25 DBFO	100
	A1 DD	100
	Second Severn Crossing	100

It can be seen from Table 2.3 that three areas had significant data loaded after the expected load date. This was due to a reduced early survey period caused by a delay in letting the survey contract (further discussed in section 2.3).

2.2 Suitability of data loaded

As part of the LECF calculation the survey data is visually inspected to help identify issues which should be resolved. For the 2014 survey, two types of anomalies were observed:

- Lengths where the data suggests that either the test wheel was up or it had experienced a puncture.
- Lengths where low or very low SC values were observed and may require additional investigation.

These lengths were identified and supplied to the HA for discussion with the survey contractor.

2.3 Survey spread

The purpose of the LECFs is to correct for the seasonal and between year variations in skid resistance experienced on the network. However, the longer the timescale for the survey of a road the more likely the correction will start to become unsuitable for parts of the survey due to changes in the weather. Therefore, in order to obtain the most robust data it is necessary to conduct surveys within an Area in a short timescale, with particular attention paid to the time taken to survey an individual road. In addition any

surveys not conducted in the target survey period will cause issues with the calculation of LECF values in future years.

The spread of survey dates for each Area is shown in Figure 2.1. The coloured bars represent the extent of the period during which the survey for that Area was undertaken, the vertical red lines show the survey period boundaries, and the crosses mark dates when surveys were conducted.

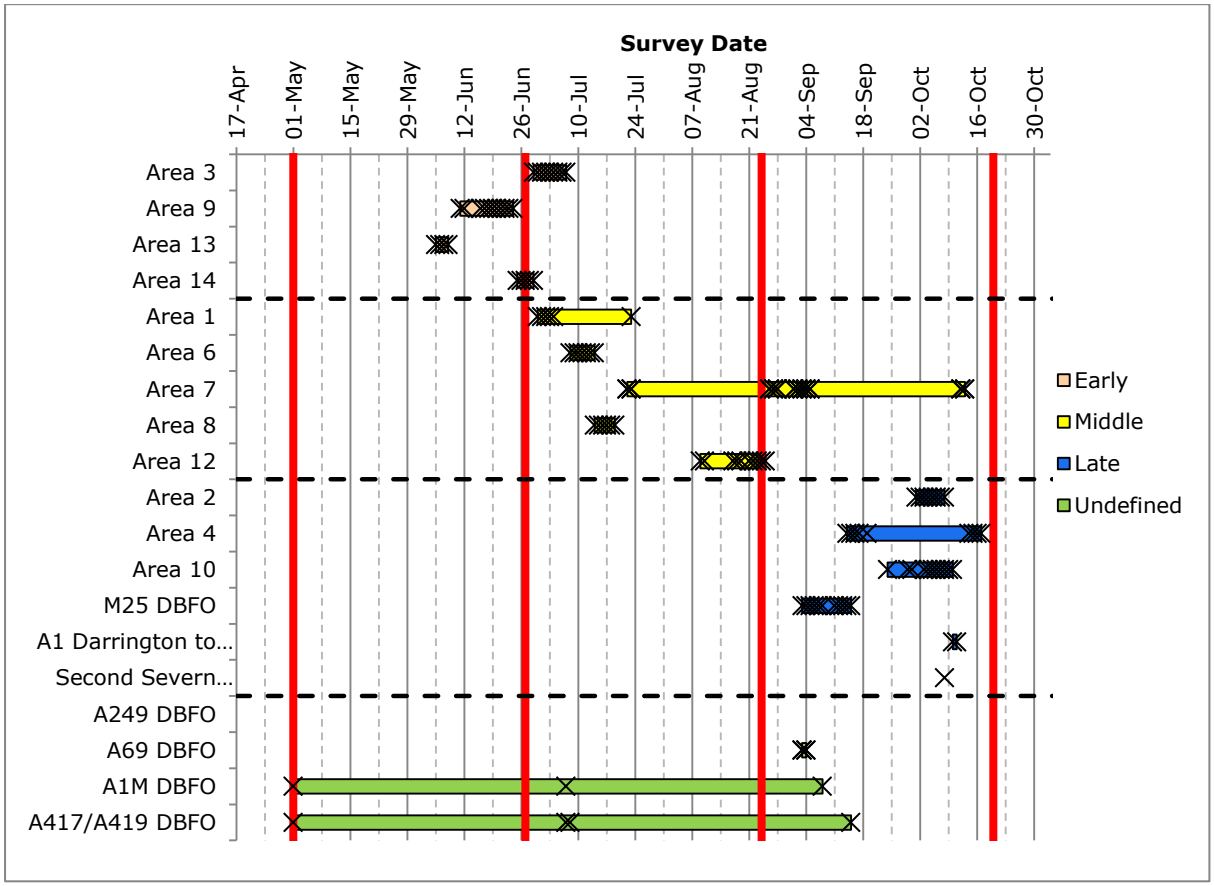

Figure 2.1 Spread of survey dates in 2014 (lane 1 SASS surveys)

As discussed in section 2.1 four of the HA Areas were surveyed outside of the target survey period. These were Area 3, Area 7, Area 12 and Area 14.

The surveys for Area 12 and Area 14 ran over into the next survey period by one and two days respectively. It was therefore decided that the survey period boundaries would be extended for these two areas to use all of the surveys. This extended survey period will also be used when extracting data for these areas from 2014 when calculating future LECF values.

Area 3 was surveyed in the first two weeks of the middle period (the target was the early period). For the 2014 LECF calculation the early survey period for this area was extended by two weeks in order to use all of the data. In future LECF calculations, where the 2014 data is used as part of the historic data, using the 2014 data as an early survey may not be suitable. Therefore, for the next three years at least two LECFs (one using the 2014 as an early survey, and the others using other past years to obtain a historic early data set) should be calculated for each locality in Area 3. The results from applying these LECFs should then be assessed and the most suitable LECFs selected.

The surveys for Area 7 were targeted for the middle period, and were conducted in the middle of the middle period, the start of the late period and the end of the late period. The spread of survey dates by road in Area 7 is shown in Figure 2.2.

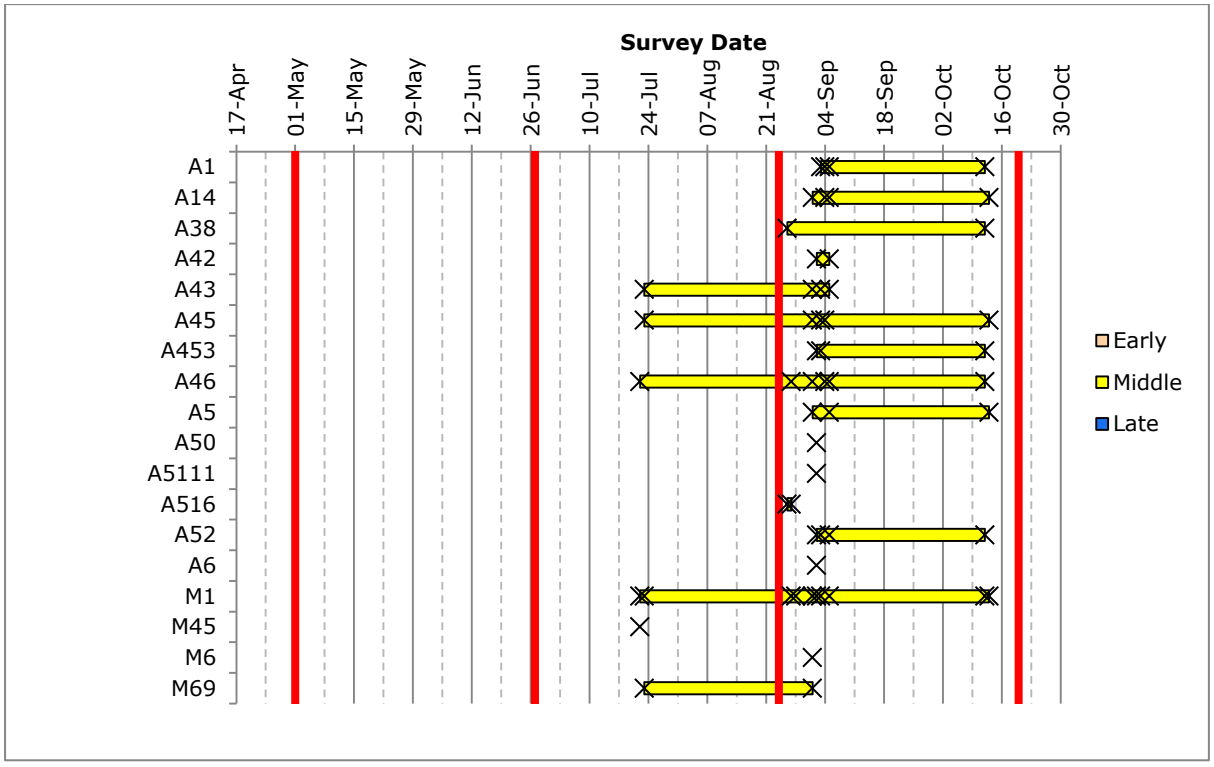

Figure 2.2 Spread of survey dates in 2014 in Area 7 (lane 1 SASS surveys)

This has meant that for Area 7, a mixture of late, middle and extended middle LECFs were calculated depending on the specific survey dates for the locality. The type of LECF used for each locality is shown in Table 2.4.

Table 2.4 Type of LECF used for Area 7 localities

Road	LECF type(s)
A1	Late
A14	Late
A38	Late
A42	Late
A43	Extended Middle
A45	Middle and Late
A453	Late
A46	Middle and Late
A5	Late
A50	Late
A5111	Late
A516	Late
A52	Late
A6	Late
M1	Middle and Late
M45	Middle
M6	Late
M69	Extended Middle

It is likely that the majority of 2014 data for Area 7 will not be suitable for use as part of the LESC value in future LECF calculations. Therefore for the next three years it is recommended that the Area 7 LECF values are calculated using alternative past years and tested for suitability.

In addition to the surveys conducted outside of the target survey period it can be seen from Figure 2.1 that the surveys for Area 1 and Area 4 were conducted over a reasonably large time frame. The spread of survey dates by road for these two Areas are shown in Figure 2.3 and Figure 2.4.

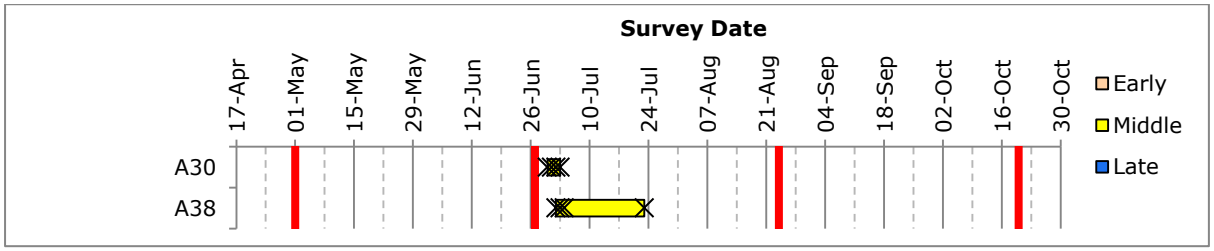

Figure 2.3 Spread of survey dates in 2014 in Area 1 (lane 1 SASS surveys)

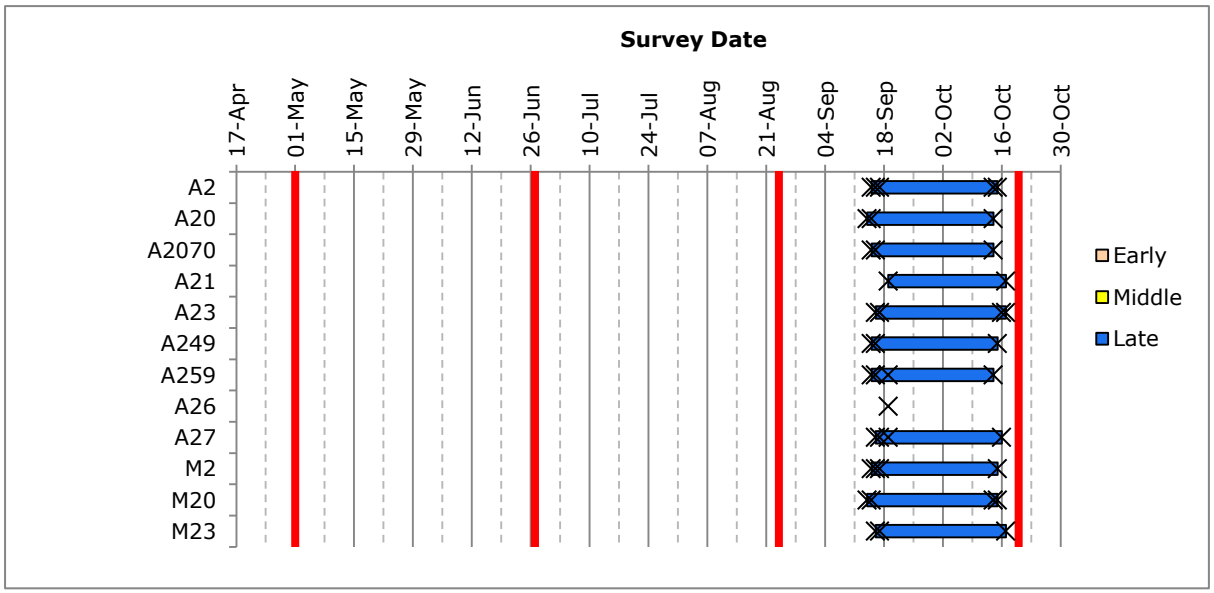

Figure 2.4 Spread of survey dates in 2014 in Area 4 (lane 1 SASS surveys)

From these graphs (Figure 2.3 and Figure 2.4) it can be seen that not only were these Areas surveyed over several weeks, so were several of the roads within the Area. This will therefore result in less robust data. It will however be possible to consider this data for use in future LECF calculations.

3 LECF Calculation and visual analysis

3.1 Early Period LECFs

An examination of the survey rotation for the past three years of surveys found that all of the Areas with a target of an Early survey in 2014 had a suitable combination of survey periods for calculation of the LESCs.

Visual analysis carried out on the early survey data identified a number of sections that needed to be removed from the LECF analysis due to anomalies (localised differences between the survey data from different years, for example, as a result of maintenance). The length of data removed and the length with skid resistance data remaining is shown in Table 3.1.

Table 3.1 Data removed as a result of visual analysis for early surveys

Area	Length removed by visual analysis (km)	Remaining length with survey data (km)
Area 3	19.20	1248.05
Area 9	44.16	1656.79
Area 13	23.70	776.99
Area 14	17.97	684.08

One road which had early surveys in 2014 had a significant length of data removed (>10km). This was the M6 in Area 13. All but one road (A50 in Area 9) that had sufficient data to calculate a road LECF prior to the visual analysis still had enough data for a road LECF calculation after the removal of anomalies identified by the visual analysis.

3.2 Middle Period LECFs

As with the early period surveys, the past years' survey rotation was examined prior to calculation of the mid period LECFs. It was found that the standard past years' survey rotation was suitable for the majority of the areas.

In 2012 a large percentage of Area 8 (one of the areas targeted with a middle period survey this year) was surveyed just outside the target period for that year (late period survey). It was therefore necessary to extend the date range of the data collected for the past years' data for Area 8 to account for this.

The surveys for Area 7, were targeted for a middle period survey this year, but were however surveyed over the middle and late period (see section 2.3). Therefore this Area was analysed as part of the late period surveys and is discussed in section 3.3. The visual analysis of the middle period surveys identified a number of sections for removal from the analysis, spread over the Areas as shown in Table 3.2.

Table 3.2 Data removed as a result of visual analysis for middle surveys

Area	Length removed by visual analysis (km)	Remaining length with survey data (km)
Area 1	20.54	623.30
Area 6	89.40	1230.14
Area 8	28.12	820.53
Area 12	28.71	1168.05

Five roads had a significant length of data removed (>10km). These were the A38 in Area 1, and the A11, A12, A47 and M11 in Area 6. All of the roads that had sufficient data to calculate a road LECF prior to the visual analysis still had sufficient data following the removal of anomalies identified by the visual analysis.

3.3 Late Period LECFs

An examination of the survey rotation for the past three years of surveys found that most of the data had a suitable combination of survey periods for calculation of the LESCs.

In 2011 the A1 Darrington to Dishforth was surveyed just outside of the target survey period (this is discussed further in 3.4.1). It was therefore necessary to extend the date range of data collected for the past years' data for this DBFO to account for this.

The visual analysis carried out on the late period surveys (and Area 7) identified a number of sections for removal. The lengths removed and the remaining lengths used in the calculation, by Area, are shown in Table 3.3.

Table 3.3 Data removed as a result of visual analysis for late surveys (and Area 7)

Area	Length removed by visual analysis (km)	Remaining length with survey data (km)
Area 2	74.48	1109.64
Area 4	30.83	985.87
Area 7	49.92	1231.45
Area 10	59.05	1226.69
A1 DD DBFO	5.17	119.10
A69 DBFO	10.23	161.75
M25 DBFO	41.57	960.49
Second Severn Crossing DBFO	6.00	20.90

Seven roads had significant lengths of data removed (>10km). These were the A303, M4, and M5 from Area2, A1 from Area 7, A69 from A69 DBFO and M25 from M25 DBFO. All but one road (A46 in Area 2) that had sufficient data to calculate a road LECF prior to the visual analysis still had enough data for a road LECF calculation after the removal of anomalies identified by the visual analysis.

3.4 DBFOs

LECFs are also calculated, were possible, for any DBFOs that have data loaded into HAPMS.

3.4.1 A1 Darrington to Dishforth

An analysis of the past years survey rotation for the A1 Darrington to Dishforth DBFO found that (on initial inspection) the last three years are not suitable for use to produce the LESC. This is because the 2011 and 2013 surveys took place in the middle period (the 2012 survey was in the early period). The survey dates for A1 Darrington to Dishforth are provided in Table 3.4.

Table 3.4 Survey dates for A1 Darrington to Dishforth DBFO

	2011	2012	2013	2014
Survey start date	24th Aug	19th May	8th August	10th October
Survey period	Middle	Earl	Middle	Late

However it is noted that the 2011 survey was carried out on the survey boundary (the late season runs from the 25th August to 20th October). It was therefore decided that for use in the LECF calculation the 2011 survey would be treated as a late survey.

3.4.2 A69 DBFO

Survey data for the A69 DBFO has been loaded into HAPMS since 2011. The survey rotation for this data is shown in Table 3.5

Table 3.5 Survey periods for A69 DBFO

	2011	2012	2013	2014
Survey period	Late	Middle	Early	Late

We can see from Table 3.5 that there is a suitable rotation of survey data to calculate an LECF.

Surveys were also conducted for lane 2 of this DBFO this year, and the surveys were conducted in the same survey period as the lane 1 surveys. Therefore it was possible to apply the lane 1 LECF to the additional surveys.

3.4.3 M25 DBFO

The M25 DBFO was created in 2009, from the A282 Dartford Crossing DBFO and the majority of the previous Area 5. These two Areas shared the same survey rotation pattern and so there were no issues with calculating the LESC (long term skid resistance) for lane 1.

Surveys were also conducted for lanes 2, 3 and 4 for this DBFO this year. However these surveys were conducted in the middle period (the lane 1 surveys were in the late). Therefore it was not possible to provide LECF values for these additional surveys.

3.4.4 Second Severn crossing DBFO

The Second Severn Crossing DBFO contains just over 25km of main carriageway and approximately 2km of slip roads. This is only just over the threshold for a road LECF, and therefore it is likely that in most years (due to maintenance or anomalous data) this DBFO would not have sufficient data for the calculation of a LECF. However, the DBFO is wholly contained within Area 2 (which is surveyed in the same survey period) and other lengths of the two roads which make up the DBFO are also present in this Area. Therefore in years with low survey coverage (or high maintenance) the LECFs calculated for Area 2 are used for this DBFO.

For the 2014 survey approximately 27km of data was collected for this DBFO, and a LECF based on this data was calculated and found to be suitable.

3.4.5 Other DBFOs Loaded into HAPMS

This year data was also loaded into HAPMS for the A1M, and A417/A419 DBFOs. However only the A1M DBFO had significant lengths added (see section 2.1).

The A1M DBFO did not have a significant length of data surveyed in 2013, and all of the DBFO was surveyed in each of the survey periods in 2014. This suggests that this DBFO is being assessed using a MSSC approach, and therefore it is not possible to generate LECF values.

4 Additional observations and further work

4.1 Applying LECFs on concrete sections

During the calculation of the 2007 LECFs (Donbavand et al., 2007 and Brittain, 2007) it was identified that concrete surfaces did not appear to experience seasonal variation to the same degree as other surface types. Therefore an LECF of 1.000 (i.e. no correction) was applied to concrete sections. To determine if this assumption was still valid an additional investigation was carried out in parallel to the calculation of the LECF values in subsequent years.

The effectiveness of the LECF correction can be determined by comparing the current year's SC data (i.e. the data prior to being corrected for seasonal variation) and the current year's CSC data (i.e. seasonally corrected data) to the average of the past years' SC data (taking into account the changes in the speed correction formula in 2011). The process of applying the LECF correction should make the average of this year's CSC data match the average of the past three years'. Therefore in this data set, the past years' average is effectively the expected value. If the LECF is reducing seasonal variation then the difference between the CSC data and this expected value should be less than the difference between the SC data and the same expected value. This can be visualised by plotting the distribution of these differences. In these plots a data set which has low seasonal effects would have a mean close to zero (i.e. on average the value of the data set is the same as the average of the past years' data). In addition, a seasonally corrected data set should have a lower standard deviation for these differences (i.e. more of the data set is closer to the past years' data).

This analysis was undertaken for HRA sections (approx. 4,255km), Thin Surfacing (TSCS) sections (approx. 5,200km) and concrete sections (approx. 427km), and the results are presented in Figure 4.1, Figure 4.2 and Figure 4.3 respectively. For the concrete sections (Figure 4.3), the CSC value shown is the value that would have been generated if the LECF calculated for that road/Area was used rather than the factor of 1.000 that was actually applied.

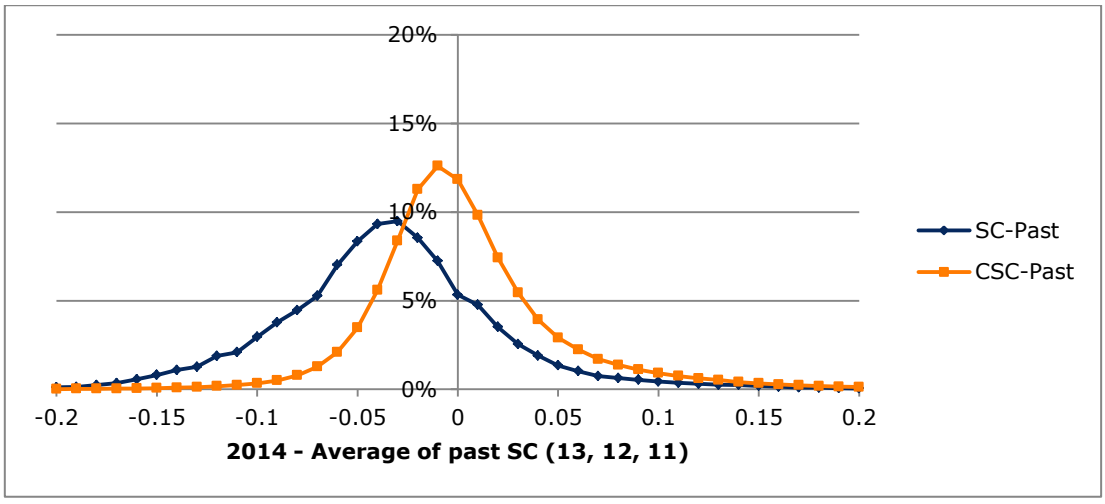

Figure 4.1 2014 data – Past year average for HRA surveys

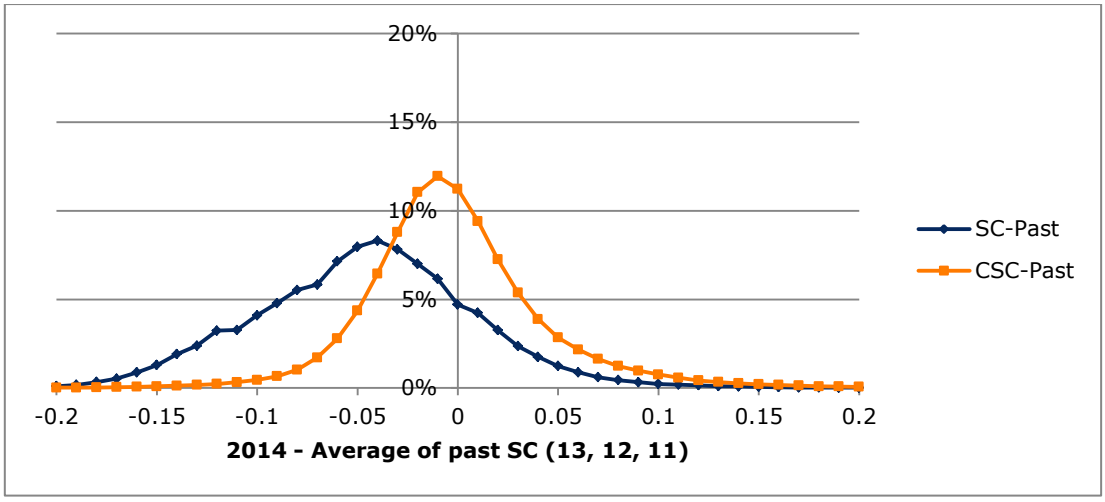

Figure 4.2 2013 data – Past year average for TS surveys

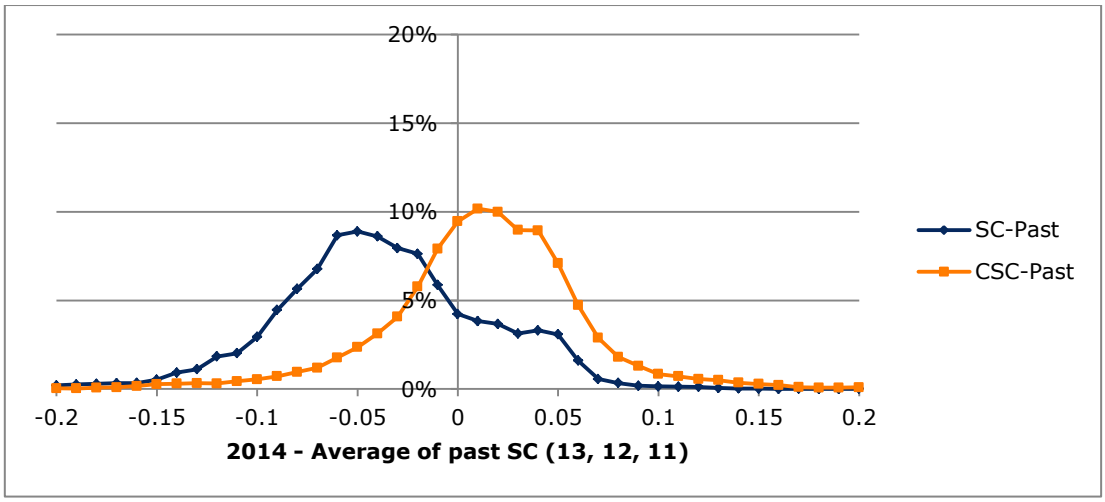

Figure 4.3 2013 data – Past year average for concrete surveys

As expected the LECFs reduce the seasonal variation for the HRA and TSCS sections. This can be seen by the narrower distribution (with mean closer to zero) in Figure 4.1 and Figure 5.2 for the 2014 CSC minus the average of past SC values in comparison to the same distribution for the 2014 SC data. However a different effect is seen for the surveys of concrete sections (Figure 4.3). This verifies the assumption that concrete sections do not experience the same seasonal variation as HRA and TSCS sections. It is however noted that the distribution of the SC-past for the concrete lengths has a non-zero average which suggests that these sections still experience some form of seasonal variation.

It can also be seen that the distribution of the 2014 SC data minus the average of past SC values was below zero for both the HRA and TSCS sections. This means in comparison to the past three years (i.e. the long term seasonal variation) this was a low skid resistance year.

4.2 LECF Distribution by date

As stated previously, the levels of skid resistance vary during the course of the year. To investigate this effect and to monitor the suitability of the survey dates, the spread of

LECF values was plotted. This investigation has been carried out at the same time as the LECF calculation since 2008 and is discussed further in the annual reports on the LECF calculation for each year.

The first part of this analysis is to plot the LECF values by date (2014 data are shown in Figure 4.4), which gives an impression of the spread of values. However, this can be hard to interpret in terms of SC data and therefore a second plot is generated. This plot is created by taking a typical value for CSC (0.5 is used in this case) and dividing by the LECF to determine an estimated SC value (2014 data are shown in Figure 4.5).

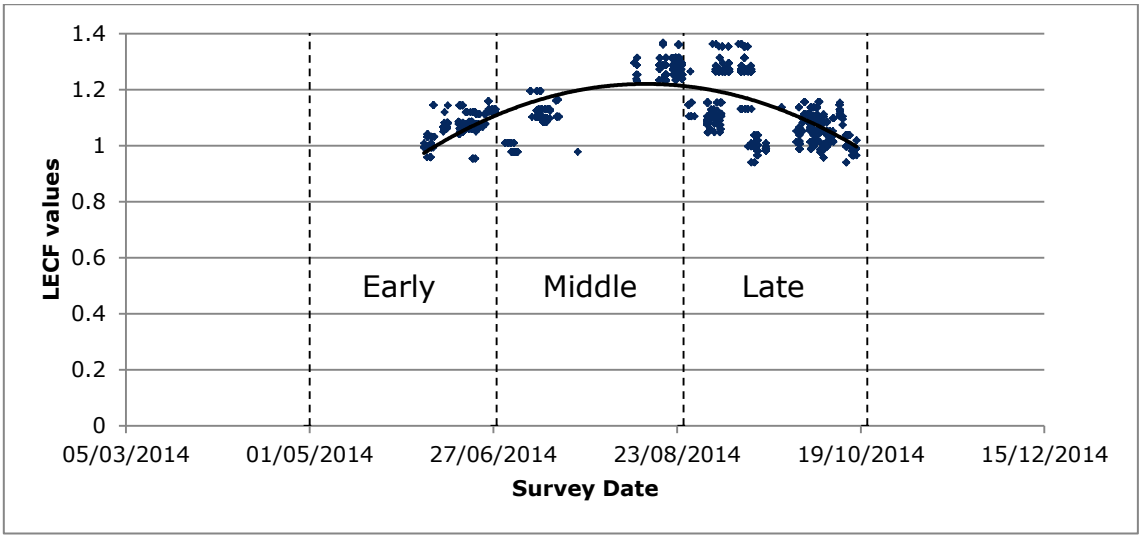

Figure 4.4 Distribution of LECF values by date

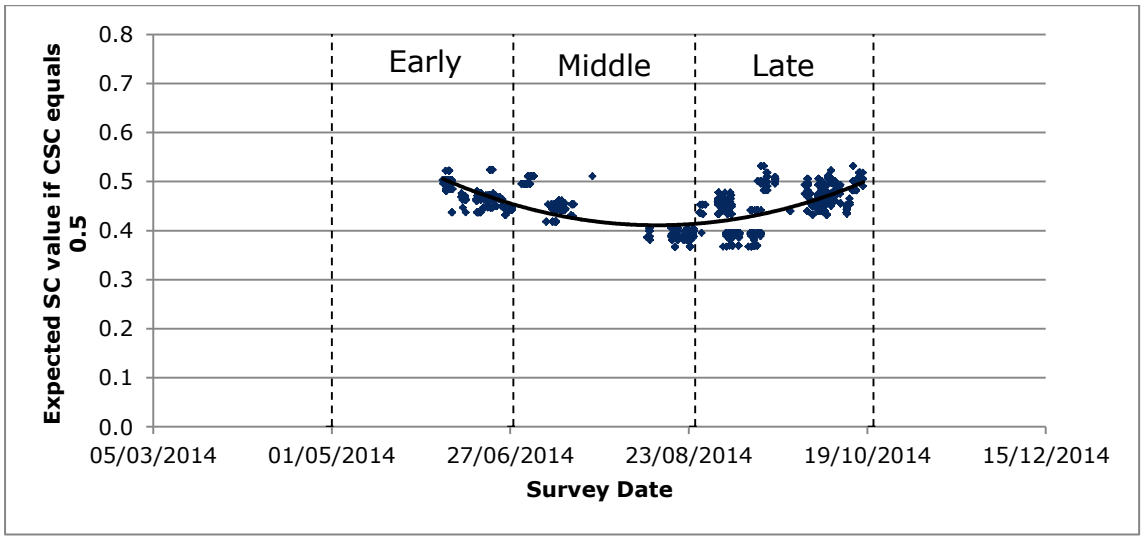

Figure 4.5 Expected SC if CSC equals 0.5

The analysis of the 2014 data suggests that the lowest point of skid resistance occurred towards the end of the middle period. Although this does not quite fit with the expected pattern there is no evidence (based on the LECF work), to suggest that the current survey boundaries are unsuitable. However, it is recommended that the suitability of the survey periods should be reviewed on an annual basis (as part of the LECF calculation and as part of the benchmark sites work).

4.3 Usage of LECF values by length

Figure 5.6 shows the length of the network to which each LECF value was applied (excluding concrete sections). The weighted average of the LECF for 2014 is 1.095 which corresponds to a low skid resistance year compared to the average of the previous three years (as noted in section 4.1).

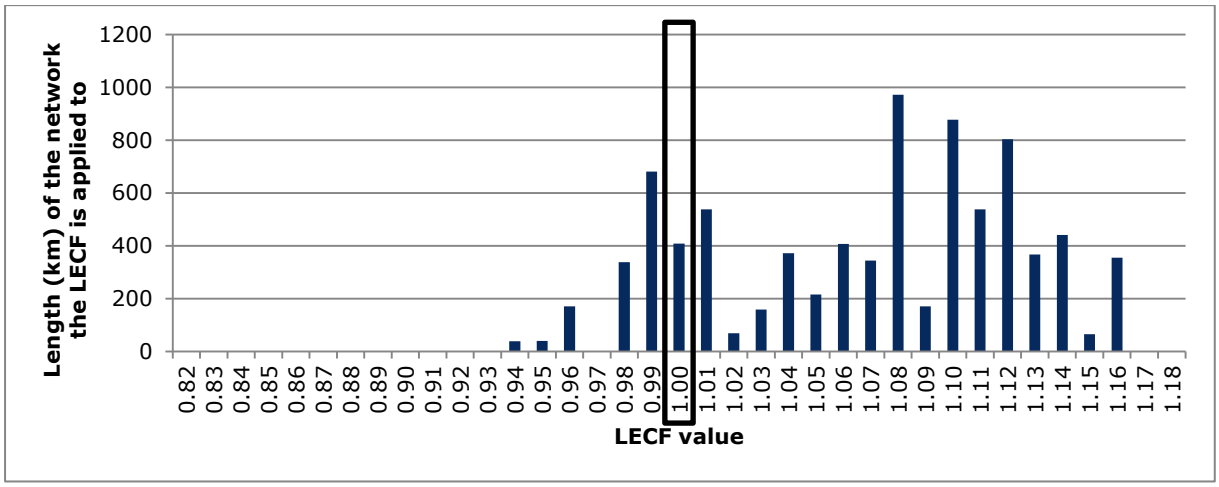

Figure 4.6 Length to which each LECF was applied

5 Summary

5.1 Lane 1 survey coverage

In the datasets used for the calculation of the LECF values, 98.1% of the network (the twelve current HA Areas) had data available for use. Each of the HA Areas had at least 96% data coverage in these datasets.

The skid resistance survey contract states that survey data should be loaded into HAPMS as soon as practicable and in any event within thirty days. An additional analysis showed that significant lengths of the network were not available by the expected load by dates (i.e. a month after the end of the survey season). It is believed that this was mainly caused by the late letting of the survey contract causing the early survey period to be condensed

Survey coverage for four of the DBFOs loaded into HAPMS (A1DD, A69, M25, and Second Severn crossing) was high (>=96%) and suitable for LECF calculation. Two more DBFOs had data loaded into HAPMS, A1M and A417/A419. Data from each of the survey periods was loaded for the A1M (and no data was loaded in 2013), which suggests the MSSC approach is being used with this data. Only 15% of the A417/A419 had data loaded into HAPMS and therefore is unsuitable for LECF calculation.

5.2 Suitability of data loaded

During the processing of the data for the LECFs a few anomalies were found with the data. These were:

1. Lengths where the data suggests that either the test wheel was up or it had experienced a puncture.
2. Lengths where low or very low SC values were observed and may require additional investigation.

These lengths were identified and supplied to the HA, so that they could be discussed with the survey contractors.

5.3 Lane 1 survey dates and timescales

Four of the HA Areas were surveyed outside of the target survey period. These were Area 3, Area 7, Area 12 and Area 14. The surveys for Area 12 and Area 14 ran over into the next survey period by one and two days respectively and will therefore have little impact on future LECF calculations.

Area 3 was surveyed in the first two weeks of the middle period (the target was the early period). Area 7 was surveyed in the middle of the middle period, the start of the late period and the end of the late period (the target was the middle period).

For the remaining Areas, the majority of the lane 1 surveys were conducted within or around 2 weeks. However, for two Areas (Area 1 and Area 4) the surveys took over 2 weeks to complete. On examination of the localities within these Areas (road and Area combination) it could be seen that the majority of these localities the surveys took over 2 weeks to complete.

5.4 Calculation of LECF

The modified LECF procedure used since 2007 (Brittain, 2007) was used again during 2014. To aid the visual analysis of the data the automated analysis developed during 2008 (Brittain, 2009) was also used.

The survey rotation pattern established for the HA Areas meant that, for the lane 1 surveys, most of the Areas had valid past years' data in the standard years (2011, 2012 and 2013). However, a large percentage of Area 8 was surveyed just outside of its target period in 2012 and for the A1DD DBFO in 2011. It was therefore necessary to extend the date range of data collected for the past years' data for these Areas to account for this.

Visual analyses of the survey data was carried out which identified several sections for removal. All but two roads that had sufficient data to calculate the more robust road LECF prior to the visual analysis still had enough data after the removal of lengths identified during the visual analysis.

As with previous years, the lane 1 LECFs were calculated for DBFOs with sufficient data loaded into HAPMS. This year LECFs were calculated for the A1DD, A69, Second Severn Crossing and M25 DBFOs.

5.5 Surveys of lanes other than lane 1

For some DBFOs there is a requirement to survey lanes in addition to lane 1. If these surveys take place in the same survey period as the lane 1 surveys then the lane 1 LECFs can be applied to the other lanes. The suitability of these LECFs would also be improved if the additional surveys were conducted within the same week as the lane 1 surveys.

This year additional surveys were conducted for the A69 and M25 DBFO. The A69 DBFO additional surveys were carried out in the same period as the lane 1 surveys and therefore had the lane 1 LECF applied. The M25 DBFO additional surveys were conducted in the middle period (the lane 1 surveys were in the late period) and therefore no LECFs were supplied for the additional surveys in the M25 DBFO.

5.6 Seasonal variation of concrete sections

An investigation into the application of LECFs on concrete sections confirmed the findings from previous studies that concrete sections do not experience the same seasonal variation as asphalt sections.

5.7 Variation of LECF values during the survey season

As with previous years, the spread of LECF values (by date) was investigated. This analysis suggests that for 2014 the lowest point in SC was experienced towards the end of the middle season. In addition the weighted average LECF value for the network was 1.095 showing that the skid resistance of the network was lower than the average of the previous three years.

References

Brittain S (2007). Task 1: Methodology for deriving Local Equilibrium Correction Factors for the 2007 SCRIM surveys (UPR/IE/15/08). Wokingham: TRL.

Donbavand J and Brittain S (2007). Task 3: Review of Correction Factors (UPR/IE/213/06). Wokingham: TRL.

Brittain S (2009). Task 1: Methodology for deriving Local Equilibrium Correction Factors for the 2008 SCRIM surveys (CPR 215). Wokingham: TRL.

Donbavand J and Kennedy C (2009). Task 2: Benchmark Surveys 2008. Wokingham: TRL.

Donbavand J and Kennedy C (2010). Task 2: Benchmark Surveys 2009. Wokingham: TRL.

Appendix A Calculating the LECF

A.1 Derivation of LECF

The following equation is used to calculate an LECF:

$$LECF = \frac{Local\ Equilbrium\ Skid\ Coefficient\ (LESC)}{Local\ Mean\ Skid\ Coefficient\ (LMSC)} \quad \textbf{A.1}$$

where LESC is the estimate of the local, long term skid resistance obtained from the average of the previous 3 years' surveys and LMSC is the average of the current year's survey in the same locality as the LESC.

The LESC incorporates one survey from each of the 3 survey periods to avoid bias in the estimate of long term skid resistance. Table A.1 shows all possible combinations of early (E), middle (M) and late (L) survey periods for the past years and current year that were used to calculate a LECF. For each current year survey period a length-weighted average[1] LECF was calculated for three localities: each road individually within each Area, for all roads within each Area, and for all roads in all Areas.

Table A.1 LECF Calculation

Combination of past years' survey periods			Current survey period	LECF calculation All combinations combined to give length weighted value for the 3 current year survey periods for each Area, road and survey period
2010	2011	2012	2013	
E	M	L	E	E • By road • By Area • By survey period
E	L	M	E	
M	E	L	E	
M	L	E	E	
L	E	M	E	
L	M	E	E	
E	M	L	M	M • By road • By Area • By survey period
E	L	M	M	
M	E	L	M	
M	L	E	M	
L	E	M	M	
L	M	E	M	
E	M	L	L	L • By road • By Area • By survey period
E	L	M	L	
M	E	L	L	
M	L	E	L	
L	E	M	L	
L	M	E	L	

The LECFs are applied by locality because the influence of climate and the type of road could affect the within year skid resistance variation and hence the LECF. Table A.2 shows the order of LECF allocation that is applied to each road. If an LECF by road does not exist or the length of road data is less than 25km[2] , the Area LECF is applied; this also occurs when a given road is surveyed but does not have a valid combination of past years' data. If an LECF by road or by Area does not exist, an LECF by survey period is

[1] An Average of all six valid combinations of past and current surveys, weighted by the length of road that each individual combination was based on.

[2] This was implemented to ensure that the LECFs by road were not based on small lengths that could have been unrepresentative of the overall road length that it was applied to. It was originally set at 50km, however after investigation into the effects during the 2007 LECF calculation it was reduced to 25km.

applied; in practice this has only occurred in 2005 on a few sections where there was no valid past years' data for any road in a given Area and survey period. There has been no occurrence of this since then.

Table A.2 Allocation of LECFs

Order of allocation	Calculation type	Description
1	Road	Calculation by individual road within an Area
2	Area	Calculation by all roads within an Area
3	Survey Period	Calculation by all roads and all Areas

A.2 Survey period boundaries

The current survey period boundaries for skid resistance surveys are given in Table A.3.

Table A.3 Survey period boundaries from the 2010 survey season onwards

Survey Period	Start Date	End Date
Early	1 May	27 June
Middle	28 June	24 August
Late	25 August	20 October

These dates were developed based on work carried out on the HA benchmark sites, which are used to monitor long term trends in skid resistance, (Donbavand et al, 2009 and Donbavand et al, 2010). Prior to 2010 the survey periods were the dates shown in Table A.4.

Table A.4 Survey period boundaries prior to the 2010 survey season

Survey Period	Start Date	End Date
Early	1 May	20 June
Middle	21 June	10 August
Late	11 August	30 September

To help smooth the transition from the MSSC (Mean Summer Skid Coefficient) approach to the SASS (Single Annual Skid Survey) method, introduced in 2004, extended survey period boundaries were used when extracting the data. This approach was taken to maximise the lengths upon which the LECF was calculated. This was originally required due to the smaller time scales allowed for the survey season, which on occasion resulted in surveys conducted outside of the planned dates. Due to the extension of the survey season in 2010, extending the dates for extraction of data is no longer necessary. The dates for these extended survey periods are shown in Table A.5.

Table A.5 Extended survey period boundaries for data before 2010

Survey Period	Start Date	End Date
Early	1 May	27 June
Middle	14 June	17 August
Late	4 August	7 October

A.3 Construction cut-off

Data from roads re-surfaced during the 5 year period covering the current year, 3 past years and a wear in year were excluded from the analysis because a comparison in skid resistance between past years and the current year was not valid. To ensure that these sections were not included in the analysis a construction cut-off date was employed to ignore any such maintenance. For the 2014 LECFs this meant that the construction cut off was 1st May 2010. Employing an extra gap of one year before the first year of the past years' data means that new surfaces will have had time for the skid resistance level to stabilise; therefore, the within year skid resistance variation for the data will not be influenced by early life skid resistance changes.

A.4 Concrete sections

It was observed in 2007 (Donbavand et al, 2007 and Brittain, 2007) that concrete sections do not experience seasonal variation in the same manner as bituminous sections. HA therefore decided that concrete sections would have an LECF of 1.00 applied (i.e. no correction). Given this, it is therefore necessary to exclude all sections which include concrete from the LECF analysis.

A.5 Visual Analysis

A visual analysis of the survey data is carried out in order to identify data which do not conform with the general pattern; these data can then be investigated further and, where appropriate, removed from the LECF calculation. The visual analysis process consists of an inspection of line charts of the current and historic data, and can be used to identify sections which appear to have been resurfaced (but do not have appropriate construction records) and other anomalies (e.g. negative skid resistance values). Once a section has been identified it is removed if more than 20% of the section is deemed to be unrepresentative.

A.6 Verification of LECF values

Once the LECF values have been calculated they are then verified in order to identify any inconsistencies. Two processes are used to do this:

1. The difference (absolute value) between the past years' values and the current year's CSC values are compared to the difference between the past years values and the current year's SC values (values which have not had the LECF correction applied). If there is an issue with the LECF then the current year's SC values will be closer to the past years' values than the current year's CSC values.

2. The line charts for the current year's CSC values against the past years' CSC values are inspected and compared to the line chart for the current year's SC values against the past years CSC values. If an LECF value is unsuitable then the lines seen in these charts would have similar shapes, i.e. they are representative of the same surface, but the average values would be different.

The verification processes were found to be particularly useful during the calculation of the Early 2007 LECFs. During the survey period, one of the survey machines underwent a repair. The verification process identified that the skid resistance values were found to be characteristically different before and after the repair. This was particularly relevant

to the M25 which had surveys carried out with the machine in both states. This was resolved by producing two LECF values for the M25 (along with two "Area" LECFs), one for before the repair and one for after.

A.7 Example detail of LECF calculation – Area 3 (Late 2005 surveys)

The tables below show the LECF calculation process for late period surveys in Area 3. Table A.1 shows the length weighted LECF calculated for each road that had valid combinations of current year and past years' data. These values were applied as the preferred option.

Table A.2 shows the LECF calculated for all roads in the Area, which was applied as a secondary option where there were roads with insufficient valid data for a LECF to be calculated or if the LECF was based on less than 25km of data. These two options would provide a LECF for the majority of roads. The final option was to apply a national LECF calculated by survey period, which is shown in

Table A.3. This is based on all roads and Areas and reflects the seasonal variation experienced for England as a whole for the late period survey in comparison to the surveys in the previous years.

The LECF method applied to Area 3 2005 late surveys is shown in

Table A.4. Seven of the road based LECFs were applied, with four roads requiring the Area LECF; two of which were due to the application of the minimum 25km data rule.

Table A.1 LECF calculated by road

Area	Road	Calculation Length (km)	LESC	LMSC	LECF
Area 3	A27	83	0.565	0.577	0.980
Area 3	A3	112	0.516	0.492	1.049
Area 3	A303	138	0.523	0.519	1.008
Area 3	A31	101	0.543	0.495	1.097
Area 3	A34	139	0.530	0.535	0.991
Area 3	A404	37	0.576	0.574	1.004
Area 3	A404M	16	0.565	0.575	0.982
Area 3	M27	3	0.532	0.519	1.026
Area 3	M271	28	0.499	0.500	0.998
Area 3	M3	288	0.522	0.520	1.003
Area 3	M4	77	0.524	0.521	1.005

Table A.2 LECF calculated by Area

Area	Calculation Length (km)	LESC	LMSC	LECF
Area 3	1023	0.530	0.523	1.013

Table A.3 LECF calculated by survey period

Area	Calculation Length (km)	LESC	LMSC	LECF
All Areas	5423	0.496	0.481	1.031

Table A.4 Application of LECF to 2005 surveys (Area 3 – late season surveys)

Area	Road	LECF	Calculation Type
Area 3	A27	0.979	Road
Area 3	A3	1.049	Road
Area 3	A303	1.007	Road
Area 3	A308M	1.013	Area
Area 3	A31	1.097	Road
Area 3	A34	0.991	Road
Area 3	A3M	1.013	Area
Area 3	A404	1.004	Road
Area 3	A404M	1.013	Area
Area 3	M27	1.013	Area
Area 3	M271	0.998	Road
Area 3	M3	1.003	Road
Area 3	M4	1.005	Road

Appendix B 2014 LECF values

Table B.1 Early season surveys

Area	Road	LECF	Type	Survey period start date	Survey period end date[3]
Area 3	A27	1.176	AREA	01/05/2014	28/06/2014
Area 3	A3	1.21	ROAD	01/05/2014	28/06/2014
Area 3	A303	1.107	ROAD	01/05/2014	28/06/2014
Area 3	A308M	1.176	AREA	01/05/2014	28/06/2014
Area 3	A31	1.163	ROAD	01/05/2014	28/06/2014
Area 3	A34	1.215	ROAD	01/05/2014	28/06/2014
Area 3	A3M	1.176	AREA	01/05/2014	28/06/2014
Area 3	A404	1.176	AREA	01/05/2014	28/06/2014
Area 3	A404M	1.176	AREA	01/05/2014	28/06/2014
Area 3	M27	1.19	ROAD	01/05/2014	28/06/2014
Area 3	M271	1.176	AREA	01/05/2014	28/06/2014
Area 3	M3	1.14	ROAD	01/05/2014	28/06/2014
Area 3	M4	1.197	ROAD	01/05/2014	28/06/2014
Area 9	A34	1.077	AREA	01/05/2014	28/06/2014
Area 9	A38	1.085	ROAD	01/05/2014	28/06/2014
Area 9	A38M	1.077	AREA	01/05/2014	28/06/2014
Area 9	A40	1.077	AREA	01/05/2014	28/06/2014
Area 9	A4097	1.077	AREA	01/05/2014	28/06/2014
Area 9	A41	1.077	AREA	01/05/2014	28/06/2014
Area 9	A4123	1.077	AREA	01/05/2014	28/06/2014
Area 9	A423	1.077	AREA	01/05/2014	28/06/2014
Area 9	A435	1.077	AREA	01/05/2014	28/06/2014
Area 9	A446	1.077	AREA	01/05/2014	28/06/2014
Area 9	A449	1.077	AREA	01/05/2014	28/06/2014
Area 9	A45	1.077	AREA	01/05/2014	28/06/2014
Area 9	A452	1.077	AREA	01/05/2014	28/06/2014
Area 9	A456	1.077	AREA	01/05/2014	28/06/2014
Area 9	A458	1.077	AREA	01/05/2014	28/06/2014
Area 9	A46	1.119	ROAD	01/05/2014	28/06/2014
Area 9	A483	1.077	AREA	01/05/2014	28/06/2014
Area 9	A49	1.143	ROAD	01/05/2014	28/06/2014
Area 9	A5	1.081	ROAD	01/05/2014	28/06/2014
Area 9	A50	1.077	AREA	01/05/2014	28/06/2014
Area 9	A500	1.112	ROAD	01/05/2014	28/06/2014
Area 9	A5127	1.077	AREA	01/05/2014	28/06/2014
Area 9	A5148	1.077	AREA	01/05/2014	28/06/2014
Area 9	M40	0.954	ROAD	01/05/2014	28/06/2014
Area 9	M42	1.06	ROAD	01/05/2014	28/06/2014
Area 9	M5	1.061	ROAD	01/05/2014	28/06/2014
Area 9	M50	1.042	ROAD	01/05/2014	28/06/2014
Area 9	M54	1.05	ROAD	01/05/2014	28/06/2014
Area 9	M6	1.067	ROAD	01/05/2014	28/06/2014
Area 9	M69	1.077	AREA	01/05/2014	28/06/2014
Area 13	A585	1.144	ROAD	01/05/2014	28/06/2014

[3] Note this date refers to the cut off (applied at midnight) for the surveys i.e. 28/06/2014 here would include all of the surveys on the 27th and none of the surveys on the 28th.

Area	Road	LECF	Type	Survey period start date	Survey period end date[3]
Area 13	A590	0.958	ROAD	01/05/2014	28/06/2014
Area 13	A595	1.04	ROAD	01/05/2014	28/06/2014
Area 13	A66	1.031	ROAD	01/05/2014	28/06/2014
Area 13	A69	1.008	AREA	01/05/2014	28/06/2014
Area 13	A7	1.008	AREA	01/05/2014	28/06/2014
Area 13	A74M	1.008	AREA	01/05/2014	28/06/2014
Area 13	M55	0.996	ROAD	01/05/2014	28/06/2014
Area 13	M6	0.994	ROAD	01/05/2014	28/06/2014
Area 14	A1	1.122	ROAD	01/05/2014	28/06/2014
Area 14	A167	1.13	AREA	01/05/2014	28/06/2014
Area 14	A168	1.13	AREA	01/05/2014	28/06/2014
Area 14	A177	1.13	AREA	01/05/2014	28/06/2014
Area 14	A184	1.13	AREA	01/05/2014	28/06/2014
Area 14	A19	1.13	AREA	01/05/2014	28/06/2014
Area 14	A194M	1.13	AREA	01/05/2014	28/06/2014
Area 14	A195M	1.13	AREA	01/05/2014	28/06/2014
Area 14	A1M	1.124	ROAD	01/05/2014	28/06/2014
Area 14	A6055	1.13	AREA	01/05/2014	28/06/2014
Area 14	A61	1.13	AREA	01/05/2014	28/06/2014
Area 14	A66	1.158	ROAD	01/05/2014	28/06/2014
Area 14	A66M	1.13	AREA	01/05/2014	28/06/2014
Area 14	A68	1.13	AREA	01/05/2014	28/06/2014
Area 14	A689	1.13	AREA	01/05/2014	28/06/2014
Area 14	A690	1.13	AREA	01/05/2014	28/06/2014
Area 14	A696	1.13	AREA	01/05/2014	28/06/2014

Table B.2 Middle season surveys

Area	Road	LECF	Type	Survey period start date	Survey period end date[4]
Area 1	A30	1.01	ROAD	28/06/2014	25/08/2014
Area 1	A38	0.978	ROAD	28/06/2014	25/08/2014
Area 6	A1	1.125	ROAD	28/06/2014	25/08/2014
Area 6	A11	1.125	ROAD	28/06/2014	25/08/2014
Area 6	A12	1.13	ROAD	28/06/2014	25/08/2014
Area 6	A120	1.098	ROAD	28/06/2014	25/08/2014
Area 6	A14	1.195	ROAD	28/06/2014	25/08/2014
Area 6	A47	1.102	ROAD	28/06/2014	25/08/2014
Area 6	M11	1.084	ROAD	28/06/2014	25/08/2014
Area 8	A1	1.171	ROAD	28/06/2014	25/08/2014
Area 8	A11	1.136	ROAD	28/06/2014	25/08/2014
Area 8	A14	1.16	ROAD	28/06/2014	25/08/2014
Area 8	A1M	1.158	ROAD	28/06/2014	25/08/2014
Area 8	A414	1.153	AREA	28/06/2014	25/08/2014
Area 8	A421	1.16	ROAD	28/06/2014	25/08/2014
Area 8	A428	1.179	ROAD	28/06/2014	25/08/2014
Area 8	A5	1.164	ROAD	28/06/2014	25/08/2014
Area 8	M1	1.103	ROAD	28/06/2014	25/08/2014
Area 8	M11	1.155	ROAD	28/06/2014	25/08/2014

[4] Note this date refers to the cut off (applied at midnight) for the surveys i.e. 28/06/2014 here would include all of the surveys on the 27th and none of the surveys on the 28th.

Area	Road	LECF	Type	Survey period start date	Survey period end date[4]
Area 12	A1	1.287	ROAD	28/06/2014	25/08/2014
Area 12	A1033	1.287	AREA	28/06/2014	25/08/2014
Area 12	A160	1.287	AREA	28/06/2014	25/08/2014
Area 12	A162	1.287	AREA	28/06/2014	25/08/2014
Area 12	A180	1.287	AREA	28/06/2014	25/08/2014
Area 12	A1M	1.272	ROAD	28/06/2014	25/08/2014
Area 12	A57	1.287	AREA	28/06/2014	25/08/2014
Area 12	A58	1.287	AREA	28/06/2014	25/08/2014
Area 12	A61	1.287	AREA	28/06/2014	25/08/2014
Area 12	A616	1.36	ROAD	28/06/2014	25/08/2014
Area 12	A62	1.287	AREA	28/06/2014	25/08/2014
Area 12	A628	1.367	ROAD	28/06/2014	25/08/2014
Area 12	A63	1.231	ROAD	28/06/2014	25/08/2014
Area 12	A631	1.287	AREA	28/06/2014	25/08/2014
Area 12	A638	1.287	AREA	28/06/2014	25/08/2014
Area 12	A64	1.312	ROAD	28/06/2014	25/08/2014
Area 12	M1	1.295	ROAD	28/06/2014	25/08/2014
Area 12	M18	1.313	ROAD	28/06/2014	25/08/2014
Area 12	M180	1.233	ROAD	28/06/2014	25/08/2014
Area 12	M181	1.287	AREA	28/06/2014	25/08/2014
Area 12	M606	1.287	AREA	28/06/2014	25/08/2014
Area 12	M62	1.253	ROAD	28/06/2014	25/08/2014
Area 12	M621	1.238	ROAD	28/06/2014	25/08/2014

Table B.3 Late season surveys

Area	Road	LECF	Type	Survey period start date	Survey period end date[5]
A1 DD DBFO	A1M	1.065	ROAD	25/08/2014	21/10/2014
A1 DD DBFO	A63	1.064	AREA	25/08/2014	21/10/2014
A69 DBFO	A69	1.078	ROAD	25/08/2014	21/10/2014
Area 2	A30	1.085	AREA	25/08/2014	21/10/2014
Area 2	A303	1.103	ROAD	25/08/2014	21/10/2014
Area 2	A36	0.997	ROAD	25/08/2014	21/10/2014
Area 2	A4	1.085	AREA	25/08/2014	21/10/2014
Area 2	A40	0.957	ROAD	25/08/2014	21/10/2014
Area 2	A417	1.085	AREA	25/08/2014	21/10/2014
Area 2	A46	1.085	AREA	25/08/2014	21/10/2014
Area 2	M32	1.085	AREA	25/08/2014	21/10/2014
Area 2	M4	1.156	ROAD	25/08/2014	21/10/2014
Area 2	M48	1.085	AREA	25/08/2014	21/10/2014
Area 2	M49	1.085	AREA	25/08/2014	21/10/2014
Area 2	M5	1.111	ROAD	25/08/2014	21/10/2014
Area 4	A2	1.037	ROAD	25/08/2014	21/10/2014
Area 4	A20	0.997	AREA	25/08/2014	21/10/2014
Area 4	A2070	0.94	ROAD	25/08/2014	21/10/2014
Area 4	A21	0.989	ROAD	25/08/2014	21/10/2014
Area 4	A23	0.965	ROAD	25/08/2014	21/10/2014
Area 4	A249	0.997	AREA	25/08/2014	21/10/2014

[5] Note this date refers to the cut off (applied at midnight) for the surveys i.e. 28/06/2014 here would include all of the surveys on the 27th and none of the surveys on the 28th.

Area	Road	LECF	Type	Survey period start date	Survey period end date[5]
Area 4	A259	1.008	ROAD	25/08/2014	21/10/2014
Area 4	A26	0.997	AREA	25/08/2014	21/10/2014
Area 4	A27	0.981	ROAD	25/08/2014	21/10/2014
Area 4	M2	1.001	ROAD	25/08/2014	21/10/2014
Area 4	M20	0.997	ROAD	25/08/2014	21/10/2014
Area 4	M23	1.019	ROAD	25/08/2014	21/10/2014
Area 7	A1	1.122	ROAD	25/08/2014	20/10/2014
Area 7	A14	1.09	ROAD	25/08/2014	20/10/2014
Area 7	A38	1.145	ROAD	25/08/2014	20/10/2014
Area 7	A42	1.059	ROAD	25/08/2014	20/10/2014
Area 7	A43	1.047	ROAD	10/07/2014	10/09/2014
Area 7	A45	1.104	ROAD	10/07/2014	25/08/2014
Area 7	A45	1.094	ROAD	25/08/2014	20/10/2014
Area 7	A453	1.128	ROAD	25/08/2014	20/10/2014
Area 7	A46	1.155	ROAD	10/07/2014	25/08/2014
Area 7	A46	1.153	ROAD	25/08/2014	20/10/2014
Area 7	A5	1.074	ROAD	25/08/2014	20/10/2014
Area 7	A50	1.104	AREA	25/08/2014	20/10/2014
Area 7	A5111	1.104	AREA	25/08/2014	20/10/2014
Area 7	A516	1.104	AREA	25/08/2014	20/10/2014
Area 7	A52	1.114	ROAD	25/08/2014	20/10/2014
Area 7	A6	1.104	AREA	25/08/2014	20/10/2014
Area 7	M1	1.089	ROAD	10/07/2014	25/08/2014
Area 7	M1	1.104	AREA	25/08/2014	20/10/2014
Area 7	M45	1.088	AREA	28/06/2014	25/08/2014
Area 7	M6	1.104	AREA	25/08/2014	20/10/2014
Area 7	M69	1.079	ROAD	10/07/2014	10/09/2014
M25 DBFO	A1	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A10	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A1001	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A1023	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A1089	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A12	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A127	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A13	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A1M	1.353	ROAD	25/08/2014	21/10/2014
M25 DBFO	A2	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A20	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A21	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A23	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A282	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A3	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A30	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A3113	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A312	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A316	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A40	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	A405	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	M1	1.313	ROAD	25/08/2014	21/10/2014
M25 DBFO	M11	1.131	ROAD	25/08/2014	21/10/2014
M25 DBFO	M20	1.285	ROAD	25/08/2014	21/10/2014
M25 DBFO	M23	1.264	AREA	25/08/2014	21/10/2014
M25 DBFO	M25	1.272	ROAD	25/08/2014	21/10/2014

Area	Road	LECF	Type	Survey period start date	Survey period end date[5]
M25 DBFO	M26	1.362	ROAD	25/08/2014	21/10/2014
M25 DBFO	M3	1.294	ROAD	25/08/2014	21/10/2014
M25 DBFO	M4	1.353	ROAD	25/08/2014	21/10/2014
Second Severn Crossing	M4	1.024	AREA	25/08/2014	21/10/2014
Second Severn Crossing	M48	1.024	AREA	25/08/2014	21/10/2014