

The Mall calibration Course Taping

**Raw tape results for The Mall Calibration Course**

David	6 *50m lengths	plus 28.645 m	328.645	m
Hugh	6 *50m lengths	plus 28.648 m	328.648	m
Average			328.6465	m

Assume David and Hugh pulled the tape at exactly 50N which is the standard tension figure for class 2 tapes

Convert 50N to Kg=  $50/9.81=$  5.10 Kg or = 11.23 lbs

Tape Calibration Results from NIST		
Tension Kg	Tape length 40m-100m	
20	60.02946	NIST report p2
10	60.00776	NIST report p2
0	59.98606	Calculated from 10kg & 20Kg NIST values
5.097	59.99712	calculated

So for 60m measured on tape scale adjustment needed for 50N would be  $59.99712 - 60 =$  -2.880 mm  
 Raw measurement of The Mall was 328.6465 m so adjustment needed will be -15.8 mm

So raw corrected for tension =  $328.6465 - 0.158 =$  328.631 m

Temperature Correction for 11C (as per David)  
 @0.0000115/C Correct to 20C NIST calibration temp  
 Correction =  $328.629 * (-9) * 0.0000115 =$  -34.0 mm

**THE MALL CALIBRATION COURSE CORRECTED FOR TAPE TENSION AND TEMPERTAURE =**

**328.597**

**Mike's Laser Measurement of The Mall Calibration Course**

laser readings	Deduct extra from slope of laser beam	plumb-laser ref	reflection- front face	bob to cal end mark	<b>After corrections</b>
<b>159.539</b>	-0.0029		0.016	-0.0015	<b>159.551</b>
<b>169.057</b>	-0.0027		0.016	-0.0015	<b>169.081</b>
			Corrected laser Total		<b>328.631</b>

So Laser gave a measurement which was 328.631-328.597 larger = 0.035 m

As a percentage this is 0.011%

The specification for the Bosch Professional GLM 250VF is as follows

*In unfavourable conditions (e.g. at intense sunlight or an insufficiently reflecting surface), the maximum deviation is ±20 mm per 150 m. In favourable conditions, a deviation influence of ±0.05 mm/m must be taken into account.*

**This spec is 0.013% in unfavourable conditions and 0.005% in favourable conditions , so the laser measurement is consistent with its specified accuracy**

**Mike's Calibrations**

**Specialized All Cond Armadillo 700x25 tyre pumped ~ 110psi on 9 June at 10.00**

Long Tow, Abingdon, Cal length							595.283 m							
Date	Time	start R1	end R1	end R2	end R3	end R4	CONSTANT	Ride 1 count	Ride 2 count	Ride 3 count	Ride 4 count	av temp C		
10 Jun 2012	07:00:00	20925.5	27594.5	34262	40929.5	47597.5	<b>11212.6</b>	6669	6667.5	6667.5	6668	11.1	dry	
11 Jun 2012	05:30:00	86300	92970	99639.5	6508.5	12978	<b>11215.1</b>	6670	6669.5	6869	6469.5	11.4	very wet – rain	
12 Jun 2012	04:45:00	47009.5	53680	60349.5	67021.2	73691.8	<b>11216.9</b>	6670.5	6669.5	6671.7	6670.6	10.6	wet -no rain	
13 Jun 2012	19:56:00	5747	12414	19081	25748.3	32415	<b>11210.9</b>	6667	6667	6667.3	6666.7	15.3	dry	
14 Jun 2012	05:12:00	66417	73088.5	79759.2	86480.5	93101.5	<b>11217.9</b>	6671.5	6670.7	6721.3	6621	8.8	dry	

N.B The Mall is very smooth but with holes, Long Tow was resurfaced with tar and small stones last summer, and is much rougher. For a pneumatic tyre The Mall should give a larger constant.

The Mall Cal Length							328.597 m								
Date	Time	start R1	end R1	end R2	end R3	end R4	CONSTANT	Ride 1 count	Ride 2 count	Ride 3 count	Ride 4 count	av temp C			
13 Jun 2012	02:07:00	25247	28930.5	32613.5	36297	39980.8	<b>11220.84</b>	3683.5	3683	3683.5	3683.8	11.1	dry		
13 Jun 2012	04:37:00	26645	30328	34012	37695.5	41379	<b>11220.99</b>	3683	3684	3683.5	3683.5	10	dry		
							average used	<b>11220.91</b>							

**MIKE'S RIDE RESULTS**

Constant 11220.9 cts/km

Hugh's measurement schedule	Hugh's No.	Mike's description of Hugh's location	Count	count Inc	Dist inc km	Cum dist km
Start/Finish	1	LP	42213			
Traffic light Westminster br	2	????unclear note	60307	18094	1.6125	1.6125
3 <sup>rd</sup> expansion joint	3	Joint on N side	61364.5	1057.5	0.0942	1.7068
3 <sup>rd</sup> expansion joint	3	Joint on S side	61570			1.7068
Ped light at start Mall	4	dashed line	78314	16744	1.4922	3.1990
Start/Finish	5	Mid point between Tarmac join lines	82458	4144	0.3693	3.5683
Start/Finish	5	Mid point between Tarmac join lines	82458			
Between Telephone Boxes	6	Between Telephone Boxes	90011	7553	0.6731	0.6731
Cleopatra's needle	7	R	96473	6462	0.5759	1.2490 Temp=11.8C
Last LP before Waterloo Bridge	8	LP on L	98680	2207	0.1967	1.4457
WL Hill – start divider	9	Start Divider on R	14624	15944	1.4209	2.8666
Paternoster Sq Tree apron	10	Paternoster Sq:N edge Column on L	23193.5	8569.5	0.7637	3.6303
1 <sup>st</sup> LP Cheaopside	10a	Lp on L	32714	9520.5	0.8485	4.4788
bread St E Kerb	11	level with kerb of road on R	34575	1861	0.1659	4.6446
TI Leadenhall str	12	Post on R	45834	11259	1.0034	5.6480
finger Post Eastcheap	13	finger pole on L	50812	4978	0.4436	6.0917
Start is. Before Byward St	14	First edge divide in centre	54816	4004	0.3568	6.4485
Tower Hill turn	15	Turn at divider near Tower	58533	3717	0.3313	6.7798
London Br LP2	16	LP centre on L	68100	9567	0.8526	7.6324
Ped light at Millennium Br	17	TF LP on L	77867	9767	0.8704	8.5028
TL opp Temple Ave	18	Pole on L	86066	8199	0.7307	9.2335
LP90 (Before HG Ave)	19	Centre LP on L	01644	15578	1.3883	10.6218
Far side BoB memorial	20	S face Block on L	04266	2622	0.2337	10.8554 Time=04:23
LP 6 George St	21	LP on R	09998	5732	0.5108	11.3663
LPG92 Birdcage Walk	22	C88 on R	17367.5	7369.5	0.6568	12.0230
Ped light The Mall	23	dashed line	22220	4852.5	0.4325	12.4555
Start/Finish	24	Start/finish	26362	4142	0.3691	12.8246

## HUGH'S CALIBRATIONS

Date	Time	start R1	end R1	The Mall Cal Length			328.597 m	Ride 1 count	Ride 2 count	Ride 3 count	Ride 4 count
				end R2	end R3	end R4	CONSTANT				
13 Jun 2012	02:30:00	82000	85699	89398	93096	96795	<b>11267.45</b>	3699	3699	3698	3699
13 Jun 2012	04:40:00	85000	88698	92396	96094	99792	<b>11265.16</b>	3698	3698	3698	3698
							average used	<b>11266.30</b>			

**HUGH'S RAW COUNTS****Constant 11266.30 cts/km**

<b>Hugh's measurement schedule</b>	<b>Hugh's No.</b>	<b>Count</b>	<b>count Inc</b>	<b>Dist inc km</b>	<b>Cum dist km</b>
Start/Finish	1	00000			
Traffic light Westminster br	2	18166	18166	1.6124	1.6124
3 <sup>rd</sup> expansion joint	3	19226.0	1060	0.0941	1.7065
3 <sup>rd</sup> expansion joint	3	19226			1.7065
Ped light at start Mall	4	36043	16817	1.4927	3.1992
Start/Finish	5	40203	4160	0.3692	3.5684
Start/Finish	5	40203			
Between Telephone Boxes	6	47786	7583	0.6731	0.6731
Cleopatra's needle	7	54276	6490	0.5761	1.2491
Last LP before Waterloo Bridge	8	56486	2210	0.1962	1.4453
WL Hill – start divider	9	72501	16015	1.4215	2.8668
Paternoster Sq Tree apron	10	81114.0	8613	0.7645	3.6313
1 <sup>st</sup> LP Cheaopside	10a	90674	9560	0.8485	4.4798
bread St E Kerb	11	92543	1869	0.1659	4.6457
TI Leadenhall str	12	03849	11306	1.0035	5.6492
finger Post Eastcheap	13	8855	5006	0.4443	6.0936
Start is. Before Byward St	14	12875	4020	0.3568	6.4504
Tower Hill turn	15	16608	3733	0.3313	6.7817
London Br LP2	16	26220	9612	0.8532	7.6349
Ped light at Millennium Br	17	36030	9810	0.8707	8.5056
TL opp Temple Ave	18	44263	8233	0.7308	9.2364
LP90 (Before HG Ave)	19	59906	15643	1.3885	10.6249
Far side BoB memorial	20	62537	2631	0.2335	10.8584
LP 6 George St	21	68293	5756	0.5109	11.3693
LPG92 Birdcage Walk	22	75693.0	7400	0.6568	12.0261
Ped light The Mall	23	80566	4873	0.4325	12.4587
Start/Finish	24	84724	4158	0.3691	12.8277

**DAVID'S CALIBRATIONS**

Date	Time	start R1	end R1	end R2	end R3	end R4	<b>CONSTANT</b>	Ride 1 count	Ride 2 count	Ride 3 count	Ride 4 count
13 Jun 2012	02:06:00	627000	630662	634323	637985	641646	<b>11153.97</b>	3662	3661	3662	3661
13 Jun 2012	04:36:00	827000	830660	834321	837984	841645	<b>11153.21</b>	3660	3661	3663	3661
							average used	<b>11153.59</b>			

david-13jun2012

<b>DAVID'S RAW COUNTS</b>		<b>Corrected Constant</b>	<b>11153.6 cts/km</b>		
<b>Hugh's measurement schedule</b>	<b>Hugh's No.</b>	<b>Count</b>	<b>count Inc</b>	<b>Dist inc km</b>	<b>Cum dist km</b>
Start/Finish	1	644000			
Traffic light Westminster br	2	661988	17988	1.6128	1.6128
3 <sup>rd</sup> expansion joint	3	663035.0	1047	0.0939	1.7066
3 <sup>rd</sup> expansion joint	3	663035.0			1.7066
Ped light at start Mall	4	679687	16652	1.4930	3.1996
Start/Finish	5	683807	4120	0.3694	3.5690
Start/Finish	5	683807			
Between Telephone Boxes	6	691317	7510	0.6733	0.6733
Cleopatra's needle	7	697742	6425	0.5760	1.2494
Last LP before Waterloo Bridge	8	699933	2191	0.1964	1.4458
WL Hill – start divider	9	715795	15862	1.4221	2.8680
Paternoster Sq Tree apron	10	724309	8514	0.7633	3.6313
1 <sup>st</sup> LP Cheaopside	10a	733778.0	9469	0.8490	4.4803
bread St E Kerb	11	735628	1850	0.1659	4.6461
TI Leadenhall str	12	746827	11199	1.0041	5.6502
finger Post Eastcheap	13	751776	4949	0.4437	6.0939
Start is. Before Byward St	14	755756	3980	0.3568	6.4507
Tower Hill turn	15	759450	3694	0.3312	6.7819
London Br LP2	16	768967	9517	0.8533	7.6352
Ped light at Millennium Br	17	778676	9709	0.8705	8.5057
TL opp Temple Ave	18	786827	8151	0.7308	9.2365
LP90 (Before HG Ave)	19	802308	15481	1.3880	10.6245
Far side BoB memorial	20	804916	2608	0.2338	10.8583
LP 6 George St	21	810614	5698	0.5109	11.3692
LPG92 Birdcage Walk	22	817941.0	7327	0.6569	12.0261
Ped light The Mall	23	822767	4826	0.4327	12.4588
Start/Finish	24	826885	4118	0.3692	12.8280

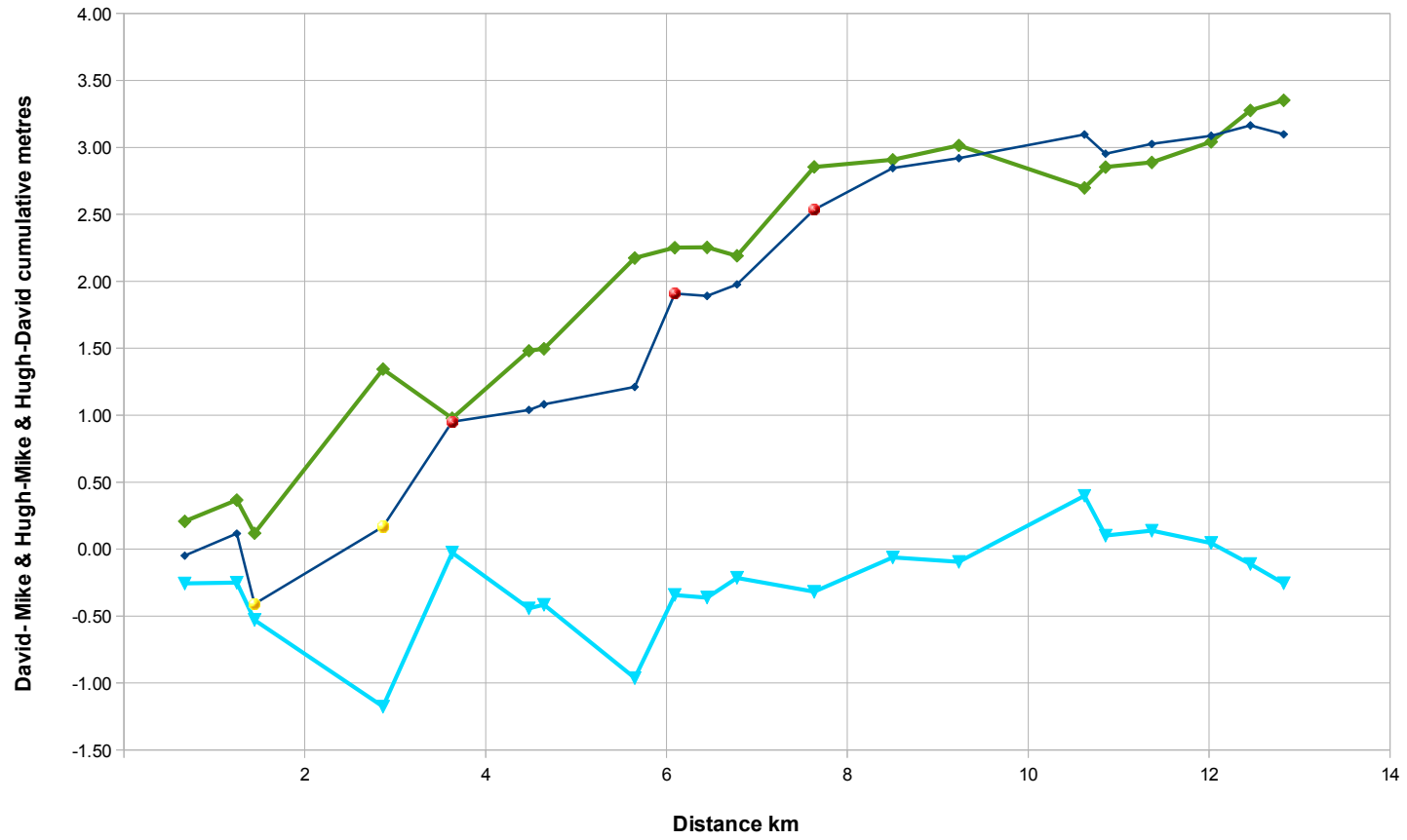


differences

### DIFFERENCES BETWEEN 3 RIDERS

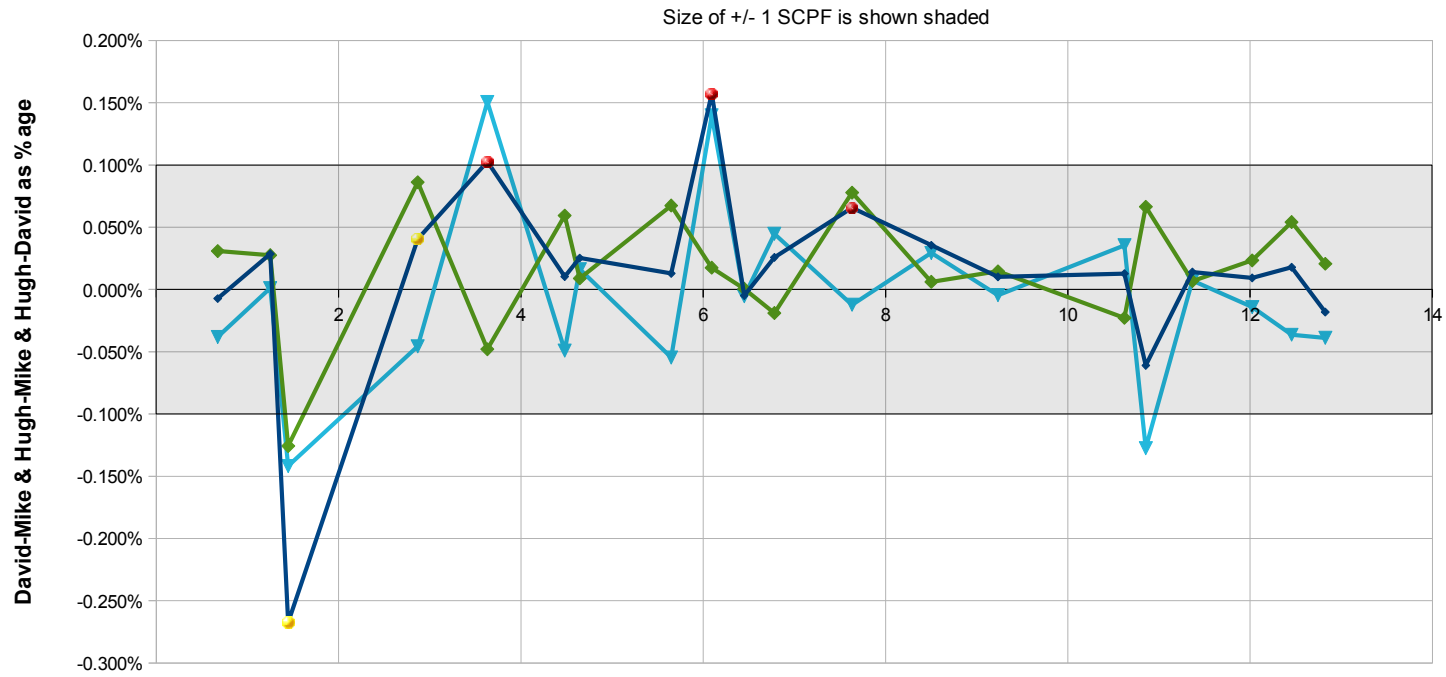
Hugh's measurement schedule	Hugh's No.	MCWS location note	Mike accumulated dist km	Hugh-mike accumulated dist m	Hugh -Mike interval m	Hugh-Mike interval %age	David-mike accumulated dist m	David -Mike interval m	David-Mike interval %age	Hugh-david accumulated dist m	Hugh – David interval m	Hugh – David interval %age
Start/Finish	1	LP			inc			inc				
Traffic light Westminster br	2	?????unclear note	1.6125	-0.11	-0.11	-0.007%	0.23	0.23	0.014%	-0.34	-0.34	-0.021%
3 <sup>rd</sup> expansion joint	3	Joint on N side	1.7068	-0.26	-0.16	-0.167%	-0.14	-0.37	-0.395%	-0.12	0.21	0.228%
3 <sup>rd</sup> expansion joint	3	Joint on S side	1.7068	-0.26			-0.14					
Ped light at start Mall	4	dashed line	3.1990	0.20	0.47	0.031%	0.62	0.76	0.051%	-0.41	-0.41	-0.028%
Start/Finish	5	Mid point between Tarmac join lines	3.5683	0.14	-0.07	-0.018%	0.69	0.08	0.021%	-0.56	-0.15	-0.039%
Start/Finish	5	Mid point between Tarmac join lines										
Between Telephone Boxes	6	Between Telephone Boxes	0.6731	-0.05	-0.05	-0.007%	0.21	0.21	0.031%	-0.26	-0.26	-0.038%
Cleopatra's needle	7	R	1.2490	0.12	0.17	0.029%	0.37	0.16	0.028%	-0.25	0.01	0.001%
Last LP before Waterloo Bridge	8	LP on L	1.4457	-0.41	-0.53	-0.267%	0.12	-0.25	-0.126%	-0.53	-0.28	-0.142%
WL Hill – start divider	9	Start Divider on R	2.8666	0.17	0.58	0.041%	1.34	1.22	0.086%	-1.18	-0.65	-0.046%
Paternoster Sq Tree apron	10	Paternoster Sq:N edge Column on L	3.6303	0.95	0.78	0.103%	0.98	-0.37	-0.048%	-0.03	1.15	0.151%
1 <sup>st</sup> LP Cheaopside	10a	Lp on L	4.4788	1.04	0.09	0.010%	1.48	0.50	0.059%	-0.44	-0.42	-0.049%
bread St E Kerb	11	level with kerb of road on R	4.6446	1.08	0.04	0.025%	1.50	0.01	0.009%	-0.42	0.03	0.016%
TI Leadenhall str	12	Post on R	5.6480	1.21	0.13	0.013%	2.17	0.68	0.067%	-0.96	-0.55	-0.055%
finger Post Eastcheap	13	finger pole on L	6.0917	1.91	0.70	0.157%	2.25	0.08	0.018%	-0.34	0.62	0.140%
Start is. Before Byward St	14	First edge divide in centre	6.4485	1.89	-0.02	-0.005%	2.25	0.00	0.001%	-0.36	-0.02	-0.005%
Tower Hill turn	15	Turn at divider near Tower	6.7798	1.98	0.09	0.026%	2.19	-0.06	-0.019%	-0.21	0.15	0.045%
London Br LP2	16	LP centre on L	7.6324	2.54	0.56	0.066%	2.85	0.66	0.078%	-0.32	-0.10	-0.012%
Ped light at Millennium Br	17	TF LP on L	8.5028	2.85	0.31	0.036%	2.91	0.05	0.006%	-0.06	0.26	0.029%
TL opp Temple Ave	18	Pole on L	9.2335	2.92	0.07	0.010%	3.01	0.11	0.015%	-0.09	-0.03	-0.004%
LP90 (Before HG Ave)	19	Centre LP on L	10.6218	3.10	0.18	0.013%	2.70	-0.32	-0.023%	0.40	0.49	0.036%
Far side BoB memorial	20	S face Block on L	10.8554	2.95	-0.14	-0.061%	2.85	0.16	0.066%	0.10	-0.30	-0.127%
LP 6 George St	21	LP on R	11.3663	3.03	0.07	0.014%	2.89	0.04	0.007%	0.14	0.04	0.007%
LPG92 Birdcage Walk	22	C88 on R	12.0230	3.09	0.06	0.009%	3.04	0.15	0.023%	0.05	-0.09	-0.014%
Ped light The Mall	23	dashed line	12.4555	3.16	0.08	0.018%	3.28	0.23	0.054%	-0.11	-0.16	-0.036%
Start/Finish	24	Start/finish	12.8246	3.10	-0.07	-0.018%	3.35	0.08	0.021%	-0.26	-0.14	-0.039%

12.8 km loop Hugh-David (in turquoise), Hugh-Mike (in dark blue), David-Mike (in green)



differences

12.8 km loop Hugh-David (in turquoise) Hugh-Mike (in dark blue) & David-Mike (in green) as a %age of each interval



MIKE'S temp-defl-cal correction

**Mikes series of calibrations corrected by average temp coeff and daily deflation to the the measurement mid point ie 13 June 03:22 temp 10.55C**

cal course	Date	Time	cts/km	av temp C		Adjust to 10.55C	Adjust for deflation	Day/time
						Temp coeff cts/C =	Deflation cts/day=	
						<b>1.36</b>	<b>1.21</b>	
Long Tow	10 Jun 2012	07:00:00	<b>11212.6</b>	11.1	dry	11213.3	<b>11216.8</b>	10:07:00:00
Long Tow	11 Jun 2012	05:30:00	<b>11215.1</b>	11.4	very wet – rain	11216.3	<b>11218.6</b>	11:05:30:00
Long Tow	12 Jun 2012	04:45:00	<b>11216.9</b>	10.6	wet -no rain	11217.0	<b>11218.1</b>	12:04:45:00
The Mall	13 Jun 2012	02:07:00	<b>11220.8</b>	11.1	dry	11221.6	<b>11221.6</b>	13:02:07:00
The Mall (average)	13 Jun 2012	03:22:00	11220.91	10.55	dry	11220.9	<b>11220.9</b>	13:03:22:00
The Mall	13 Jun 2012	04:37:00	<b>11221.0</b>	10	dry	11220.2	<b>11220.2</b>	13:04:37:00
Long Tow	13 Jun 2012	19:56:00	<b>11210.9</b>	15.3	dry	11217.4	<b>11216.5</b>	13:19:56:00
Long Tow	14 Jun 2012	05:12:00	<b>11217.9</b>	8.8	dry	11215.5	<b>11214.2</b>	14:05:12:00
Long Tow	23 Jun 2012	11:50:00	11218.1	16.4	dry	11226.1	<b>11213.5</b>	23:11:50:00

Taking 11217 as a representative cal from Long Tow corrected to 10.55C and for deflation to bring it to constant expected at 03:22 13 june, and comparing with the averaged 11221.0 on the Mall, we see that the smooth Mall surface gives about 4 cts/km more.

Constant increase on the Mall +0.036% This is consistent with what might be in general expected for a pneumatic tyre, since Long Tow is rough  
 However I have recently discovered some rather different behaviour from my pneumatic tyre

NOTE: The temperature coefficient and rate of deflation for this tyre were determined from calibration results taken between 15 May & 6 June 2011

summary of riders measurements

<b>Olympic lap measurements (without the turnaround adjustments) using 328.597m for cal course and Calculation of turnaround adjustments</b>									
<b>Lap measurements before turnrounds adjusted</b>				<b>Calculation of turnround adjustments</b>					
	short lap	long lap	course (1 short lap + 3 long laps)		Km reqd. for 8 miles	Length of 4.3m semicircle	centre move to make long lap 8 miles	km reqd. for 2 miles 385y	centre move to make correct short lap
David	3.5690	12.8280	42.0529		12.8748	0.0135	0.0166	3.5707	-0.0059
Hugh	3.5684	12.8277	42.0516		12.8748	0.0135	0.0168	3.5707	-0.0056
Mike	3.5683	12.8246	42.0422		12.8748	0.0135	0.0183	3.5707	-0.0055
							(lengthen)		(ie shorten)
fractional range	0.019%	0.026%	0.026%						

**Mike Sandford's Recommendation: Since Hugh was most familiar with the course having ridden it about 20 times take Hugh's values for the adjustment. Hugh's values are also the median values of the 3 measurements.**