

COURSE MEASUREMENT SUMMARY SHEET

EVENT: **THE GAMES OF THE XXVII OLYMPIAD
WOMEN'S MARATHON & MEN'S MARATHON**

LOCATION: **SYDNEY**

DATE: **2000-09-24 & 2000-10-01**

Promoting Organisation: **SYDNEY ORGANISING COMMITTEE
FOR THE OLYMPIC GAMES (SOCOG)**

Name & Address of race director: **Dave Cundy (Road Events Manager)
235 Jones St, Ultimo
NSW 2007, AUSTRALIA**

Tel: **+61 2 9297 2000**
Dave_Cundy@socog.com.au

Distance: **not less than 42,195m**

Measured by: **Hugh Jones**

Dates: **2000-08-19, 21, 22, 24**

Measurement method: **Jones counter mounted on bicycle wheel, steel tape**

Elevation, if not same, of: **START c.80m FINISH c.10m**

Distance, in straight line, between start & finish: **13.7km**

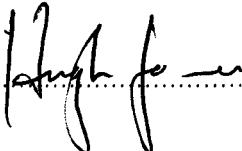
Description of the Course

- i) Terrain: **Steep downhill in first km, mostly flat to 25km except for rise in km6, then undulating to finish**
- ii) Race surface: **Well-surfaced tarmac city streets, last 500m on stadium track**
- iii) Course configuration: **Point-to-point: first 6km southbound, last 17.5km westbound. From 6-24.5km there is an out-and back section to the south-east which includes a lap of the Centennial Park road circuit between 9-12.8km**

Measurement Details

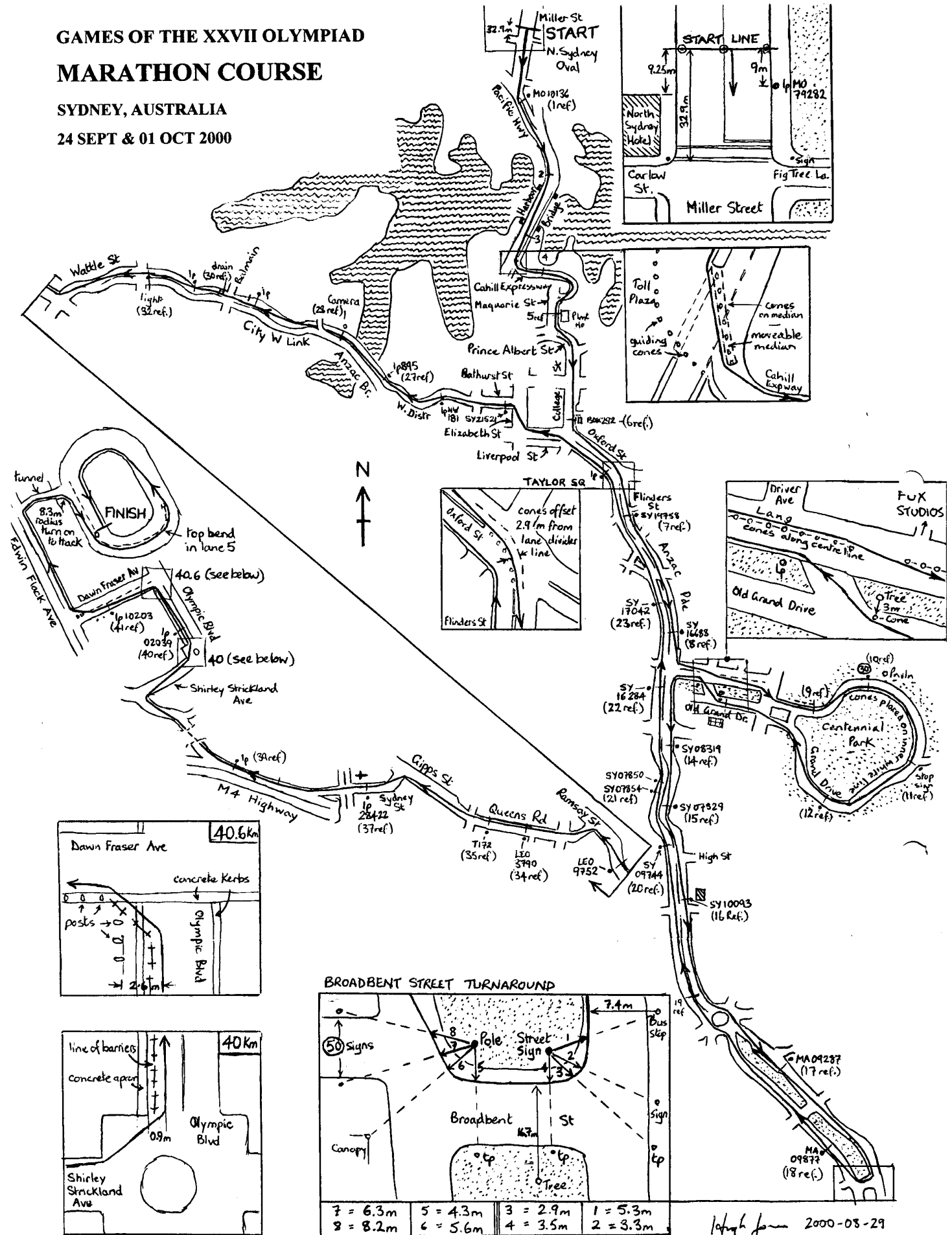
- i) Section of road available: **Entire width of roads or carriageways if divided, except: single carriageway only on Lang Road, crossing over (outbound) between Driver Ave and entry to Fox Studio; single carriageway of Dawn Fraser Ave until 40m from end; lanes 5-8 of Stadium track until start of back straight**
- ii) Line to be taken at turns: **Shortest route available except for restricted turns at: Taylor Sq (6.6km); Broadbent St turnaround (17.8km); Olympic Blvd (40km & 40.6km); using 8.3m radius coned arc from stadium tunnel to lane 8; first bend on track taken in lane 5; (see course map & details for coning)**

SIGNED:



DATE **2000-08-30**

**GAMES OF THE XXVII OLYMPIAD
MARATHON COURSE
SYDNEY, AUSTRALIA
24 SEPT & 01 OCT 2000**



7 = 6.3m	5 = 4.3m	3 = 2.9m	1 = 5.3m
8 = 8.2m	6 = 5.6m	4 = 3.5m	2 = 3.3m

high form 2000-08-29

MARATHON OF THE XXVII OLYMPIAD

SYDNEY, AUSTRALIA

WOMEN: 24 September 2000

MEN: 01 October 2000

Dave Cundy, Road Events Manager of the Sydney Organising Committee for the Olympic Games, had arranged for a measurement of the course in two sections: from the finish line back to a point at about 39.5km on the course on the Saturday; and then from this same point back to the start on the Sunday, again measuring in the reverse direction.

The Saturday measurements were done using a calibration course just outside the stadium, on Edwin Flack Avenue. After measuring on the walks course we measured from the finish line in the reverse of the running direction, moving out to lane 5 in the back straight and taking the top bend in lane 5 before moving to lane 8 approaching the stadium tunnel. The exit to the tunnel is on an 8.3m coned radius. Outside the stadium we observed the course restrictions on Dawn Fraser Blvd, moving into the opposite carriageway (in the running direction) at the first lamp post. We stopped at the next corner to note exactly how it would be barriered, and then measured between chalk marks Dave Cundy laid out. After the 40km reference the turn into Shirley Strickland Ave was also taken with barrier restrictions in mind (see map details). This measured section was completed at the 'mousehole', a tunnel under a road which gives access to the M4 highway.

On Sunday morning we resumed measuring from this point, again in the reverse of the running direction, and stopped at reference landmarks every kilometre to note our counter readings. This proved straightforward up to the 25km point, but from there on we were consistently riding against traffic, which was becoming heavier. The police escort had a difficult task to clear a path through the traffic and we often had to bide our time. Just before the 13km point we froze counters and transferred to a point 27m further down the course, on the other side of a tarmac ramp still to be built. We rode around Centennial Park, still in the reverse direction, and stopped for 30 minutes just past the 10km point. Resuming the route on Anzac Parade and Oxford Street, congestion was severe and progress slowed.

My own progress was halted completely at about 4.5km from the start, at the end of the Cahill Expressway, when I hit a drain grating and punctured. I observed the rest of the group making the crossing of the Sydney Harbour Bridge from the support vehicle. My own data was lost as no recalibration was possible.

I was able to collect data on a second ride undertaken early on Monday morning. The blue line was being laid over the Bridge, and I was able to measure from the south pylon to the start, with references taken at the kilometre points. I made a second ride of the first kilometre as this is sharply downhill, and found the reading 6 counts less. Returning to my south pylon reference I then resumed in the running direction. I paused at the moveable median and we had some discussion about its path of movement before I proceeded.

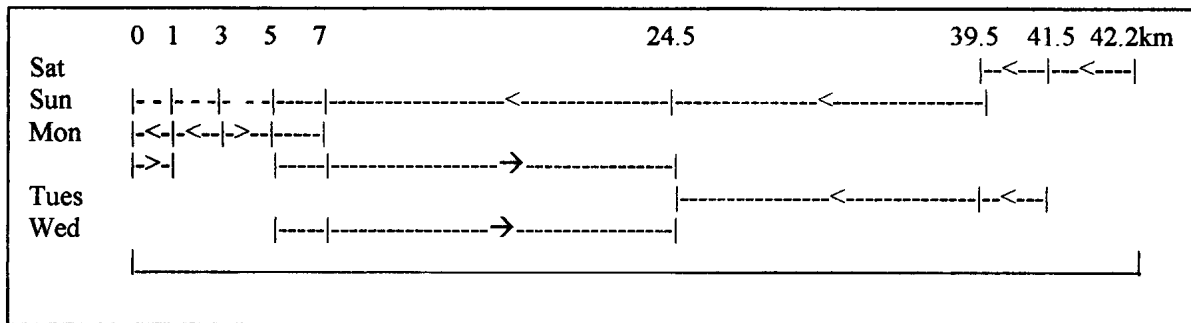
The section from 5-24.5km was done quite quickly as I could be effectively protected from behind by a single vehicle, and there was very light traffic on the roads. The blue liners were also working inside Centennial Park, so I could measure the complete course, without a break and including kilometre references, from the start to 24.5km. Both calibrations were done on the Hickson Road calibration course in the City, but the significance of this fact did not emerge until later.

The next night, accompanied by Norrie Williamson and with Dave Cundy again providing vehicle support and protection, we measured from just outside the Stadium back to the 24.5km reference point. We calibrated on the Edwin Flack Avenue calibration course outside of the stadium and recalibrated on the Hickson Road course. The measurement (including kilometre references) proceeded smoothly and quickly, with only 90 minutes between calibrations and only 0.5C temperature difference

It was therefore surprising to note that the calibration rides consistently showed that there was eight counts of difference over the 500m (16 counts/km). Mike Wickiser and I had previously checked the taping of the Hickson Road calibration course on Friday 18 August, but when Norrie Williamson, Dave Cundy and I taped the Edwin Flack Avenue course it proved to be equally accurate. We again checked the Hickson Road course and set up another 300m calibration course in the middle of the road, which allowed a small bend in the 500m course to be removed. Norrie Williamson and I returned early in the

evening of Wednesday 23 August to compare calibrations on these adjacent courses. My results showed that only a single count per kilometre could be accounted for by inadvertent 'shaving' of the taped calibration course line, by taking a more direct route between the end points. This possible explanation of the calibration differences rejected, I was anxious to complete another measurement of the 5-24.5km section of the course, this time with calibrations on both courses before and after the measurement. This involved as much strain on the vehicle driver as the riders, and Chris Robb gave Norrie and I great support in ferrying us out and back to the Olympic Park calibration site as well as providing protection for us during the ride. He also negotiated opening of the Centennial Park gates to allow us access for another unbroken ride.

The various measurement rides of the marathon course are summarised in the diagram below:



Basis for calculation of distance

The group ride used the average of Olympic Park pre-measurement calibration and Hickson Road post-measurement calibration. The large variation I found in my calibration constant between the two courses, required use of the same average to obtain any comparable result. This is why the 5-25km ride was duplicated: to use the data with a constant averaged over both courses. The only section for which I could not get a measurement sandwiched between Olympic Park pre- and Hickson Road post-calibrations was from 0-5km, across the Bridge. I therefore calculated a 'virtual' Olympic Park pre-calibration constant for this ride from the exhaustive calibration data that I had collected (see boxed text below).

Calculation of overall distance

Using the average constant to calculate segments:

finish-mousehole (39.5km): $84697 - 58000 = 2667 / 9.641632 = 2768.93m$
 mousehole – Liverpool St: $237031 - 94410 = 142621 / 9.5870775 = 14876.37m$
 Liverpool St – Parlmt Ho: $252442 - 65000 = 187442 / 9.5882035 = 19549.23m$
 + taped distance: $27.00m$
 start ref. – Parliament House: $47669 / 9.5869095^* = 4972.30m$
 TOTAL = 42193.83m

- *Notes on method of constant calculation:
- For measurement of the first 5km of the course both calibrations were done on the Hickson Road calibration course. Because there was a wide discrepancy between calibrations derived from each course (see account of measurement above), I generated a 'virtual' calibration constant for the Edwin Flack Ave. calibration course and averaged it with the actual average value obtained for the Hickson Road course (9.5783185/m).
 - The 'virtual' value was calculated by multiplying the pre-measurement Hickson Road calibration figure (9.5793197/m) by a factor of 1.0016892, obtaining 9.595501/m
 Then $(9.595501/m + 9.5783185/m) / 2 = 9.5869095/m$
 - The multiplication factor is the sum of counts obtained on all calibrations of the Flack course divided by the sum of counts obtained on the Hickson Road calibration course *using same-day calibrations under like temperature conditions only.*
 - i.e. $\frac{\text{Flack total counts}}{\text{Hickson total counts}} = \frac{9586.5 + 9588.25 + 9585.5}{9571.5 + 9570.75} = \frac{28760.25}{28711.75} = 1.0016892$

BUT, using the larger constant for calculation of segments:

finish-mousehole:	84697 – 58000 = 2667 / 9.644635	= 2768.06m
mousehole – Liverpool St:	237031 – 94410 = 142621 / 9.5950855	= 14863.96m
Liverpool St – Parlmt Ho:	252442 – 65000 = 187442 / 9.5978382	= 19529.60m
+ taped distance:		27.00m
start ref. – Parliament House:	47669 / 9.5793197	= <u>4976.24m</u>
TOTAL		= 42164.86m

Difference = approx. 29m or nearly 70% of SCPF

This accounts for only one possible source of error in the measurement – assumed to be the reaction of the bike tyre to different textures of road surface. To bolster the SCPF back up to 0.5m/km I added a further 7.8m in addition to the 1.17m required to bring the measured distance up to 42,195m. **The start line was therefore fixed 9.0m north of the start reference point, lamp-post MO79282 on the east side of Miller Street**, as indicated in the sequential presentation of elapsed distance below:

Data from measurement rides

reading	counts	distance	adjusted.dist.	location
[c = 9.5869095/m]				
23000	00000	0.00	9.00m	START: 9.0m north of tel pole MO79282, Miller St
32243	09243	964.12	973.12m	Miller Street, at tel.pole MO79282 (east side of road)
Pacific Hwy, LHS of median at lpMO13136 (o/s McDs)				
RESTART IN REVERSE DIRECTION				
13489	09243	964.12	973.12m	Pacific Hwy, LHS of median at lpMO13136 (o/s McDs)
03996	18766	1957.46	1966.46m	Bridge Approach (RHS), TF of stanchion #9
95000	27732	2892.69	2901.69m	expansion joint TF of South pylon of Bridge
RESTART				
35000	00000	2892.69	2901.69m	expansion joint TF of South pylon of Bridge
36183	28915	3016.09	3025.19m	Harbour Bridge (nr.LHS), first o/head light after S. pylon
41311	34043	3550.98	3559.98m	South Bridge approach, at start of moveable median
45352	38084	3972.50	3981.50m	Cahill Expressway at o/head direction sign
54937	47669	4972.30	4981.30m	Macquarie St (LHS), centre of first gate to Parliament Ho.
RESTART [c = 9.5882035/m]				
65000	00000	0.00	4981.30m	Macquarie St (LHS), centre of first gate to Parliament Ho.
74691	9691	1010.72	5992.03m	College Street (LHS), centre line of box292, TF Francis St
84239	19239	2006.52	6987.82m	Flinders St (LHS) at lpSY19758, TF Hannam Street
93800	28800	3003.69	7984.99m	Anzac Pde by median, lpSY16688 (LHS, 4 th past busstop)
03450	38450	4010.13	8991.43m	Grand Dr (LHS), end of 3 rd log into Park (LHS)
13012	48012	5007.40	9988.70m	Grand Dr (RHS), at 30kph sign (LHS) TS Centenary Pavn
22602	57602	6007.59	10988.89m	Grand Dr (RHS), stop sign (LHS) TF Musgrave St
32174	67174	7005.90	11987.20m	Grand Dr (RHS), at no stopping sign on LHS
14790	76790	8008.80	12990.10m	Old Grand Dri, level with east end of tennis ct fence(LHS)
42354	77354	8067.62	13048.92m	Crossover section, paint mark at top of ramp
42354	77354	+27m (taped)	13075.92m	Lang Road, at tp. opp Driver Ave
51044	86044	906.32	13982.24m	Anzac Pde (LHS), tp.2182/SY08319 (LHS) TF Alison Rd
60862	95862	1930.28	15006.20m	Anzac Pde (LHS), tp.SY07829 (LHS) TF Todman Ave
70439	105439	2929.12	16005.04m	Anzac Parade (LHS), tp.SY10093 o/s Warrane College
80020	115020	3928.36	17004.28m	Anzac Pde (by median), tp.MA09287 (LHS) TF Sturt St
89581	124581	4925.53	18001.45m	Anzac Pde (LHS), after turn, tp.MA09877, o/s #521
99188	134188	5927.49	19003.41m	Anzac Pde (by median), directn sign for s/bound carr'way
08748	143748	6924.55	20000.47m	Anzac Pde (LHS), tp.SY09744, o/s Caltex, TF High St
18170	153170	7907.21	20983.13m	Anzac Parade (LHS), at tp.SY07854
19235	154235	8018.29	21094.21m	Anzac Parade (LHS), at tp.SY07850
27767	162767	8908.13	21984.05m	Anzac Parade (LHS), tp.SY16284, TF overhead sign
37526	172526	9925.94	23001.86m	Anzac Pde (LHS) lp.T945/SY17042, TS o/head sign
46762	181762	10889.21	23965.13m	Oxford Street (LHS), at first lp on LHS
52442	187442	11481.60	24557.52m	Liverpool St, TS of middle stopline, TF College St

RESTART IN REVERSE DIRECTION [c = 9.5870775/m]

37031	00000	0.00	24557.52m	Liverpool St, TS of middle stopline, TF College St
32800	04231	441.32	24998.84m	Bathurst Street (LHS), first lp T2233/SY21521 on LHS
23169	13862	1445.90	26003.42m	Western Distr (LHS), lpNW181, before o/head direcn sign
13666	23365	2437.13	26994.65m	Western Distr (RHS), lp.895, starting climb to Anzac Br.
04023	33008	3442.96	28000.48m	Western Distr (LHS), traffic camera (RHS), TF Anzac Br.
94249	42782	4462.46	29019.98m	City West Link (LHS),last lp (RHS) before o/head sign
84821	52210	5445.87	30003.39m	City West Link (RHS), TS edge of drain, TF Balmain Rd

Missed reference – distance interpolated from separate measurement data:

{Split lies (9540/19183) x 1989.97m from 30km reference:

<i>{30003.39m + 989.64m =</i>	<i>30993.03m</i>	<i>City W Link ext (RHS), lp.2634399, 2nd after sound wall</i>		
65743	71288	7435.84	31993.36m	City West Link extn traffic light TS Dobroyd Parade
56060	80971	8445.84	33003.36m	Ramsay Street (RHS) tp.T281/LEO9752 (LHS) o/s #172
46449	90582	9448.34	34005.86m	Queens Road (LHS), tp.LEO3790, TF Lavender Street
36848	100183	10449.79	35007.31m	Queens Rd (RHS), lpT172 (LHS) opp #146 TS Walker St
27227	109804	11453.33	36010.85m	Gipps Street (LHS) tp.LEO 3508, TS Broughton Street
17738	119293	12443.10	37000.62m	Sydney Street (RHS), tp.28422 (LHS) opp. Church
08092	128939	13449.24	38006.76m	M4 highway (RHS), paint mark (end wall, before bridge)
98445	138586	14455.50	39013.02m	M4 highway (RHS), 4 th lp TS ‘mousehole’ turnoff
94410	142621	14876.37	39433.89m	tarmac seam at TF end of ‘mousehole’

RESTART (also in reverse direction, c = 9.641632/m)

84697	00000	0.00	39433.89m	tarmac seam at TF end of ‘mousehole’
79198	5499	570.33	40004.22m	Olympic Blvd (LHS), 3.58m past lp.02039 (LHS)
69506	15191	1575.56	41009.45m	Dawn Fraser Ave (by centre line) at lp10203 (LHS)
			42002.80m	Olympic Stadium track, 200m mark (by track design)
58000	26697	2768.92	42202.81m	FINISH Olympic Stadium track finish line

[NOTE: the course is nominally 7.8m overdistance. All this ‘extra’ distance is within the first, sharply downhill, kilometre. From 1km to the finish line the elapsed distance corresponds to ‘SCPF metres’]

Abbreviations:

LHS	left hand side)	used when facing in the running direction
RHS	right hand side)	(also ‘before’, ‘after’, ‘past’ are used likewise)
TF	towards finish – in running direction	TS	towards start – in running direction
tp/lp	telephone pole/lamp post	o/s	outside
o/head	overhead		

Coning requirements

In some parts of the course the prescribed route cannot be described as the ‘shortest possible route’. In order to enforce the prescribed running line cones and barriers must be set out on the course. Requirements for the placing of these obstacles are illustrated in the details on the course map, but such requirements are also listed below:

Pacific Highway – cones or barriers placed to stop runners entering the left hand carriageway at 1km

Bridge exit – cones should be placed on the moveable barrier to prevent runners kerb hopping.

Taylor Square – a line of cones should be offset 2.9m from the lane divider line to link the median in Oxford St with the central white line in Flinders St.

Lang Road – The centre line must be coned from Anzac Parade to the end of the crossover to Old Grand Drive (runners stay left of cones) and again from the Fox Studios entrance to Robertson Road (runners stay right of these cones).

Centennial Park – Grand Drive must be coned along inner white line.

Old Grand Dr – runners must round a cone placed 3m into the road from the last tree before crossover.

Broadbent St turnaround – cones placed 0.3m inside blue line. Placement defined in map detail.

Olympic Blvd – running line enters Olympic Blvd at a 0.9m offset from the concrete apron, to allow for the placement of barriers

Entering Dawn Fraser Ave – round two points: one offset 2.3m from the penultimate post on Olympic Blvd, the other being the first post on Dawn Fraser Ave (set into concrete kerblines)

Leaving Dawn Fraser Ave – Runners cross the central white line (into the right hand carriageway) after rounding a cone placed on the centre line level with the last lamp post (on LHS)

Entering the track – from the tunnel exit an arc of 8.3m radius is coned to lead runners into lane 8. Runners stay in lanes 8-5 until reaching the 800m break line, and may then take the shortest route.

List of split kilometre positions

START	Miller Street, 9m north of tel.pole MO79282 (east side of road)
1km (*)	Pacific Highway, RHS of median, 34.68m past lpMO13136 (outside McDonalds)
2km	Bridge Approach (RHS), 41.43m past far edge of stanchion #9
3km	Sydney Harbour Bridge (nr.LHS), 17.29m before first overhead light after S. pylon
4km	Cahill Expressway, 26.30m past overhead direction sign
5km	Macquarie Street (LHS), 26.50m past centre of first gate to Parliament House
6km	College Street (LHS), 15.77m past centre line of box292 on corner of Francis St
7km	Flinders Street (LHS) 19.98m past lpSY19758 on corner of Hannam Street
8km	Anzac Parade by median, 22.81m past lpSY16688 (LHS, 4 th after bus stop)
9km	Grand Drive (LHS), 16.37m past end of 3 rd log into Park (LHS)
10km	Grand Drive (RHS), 19.10m past 30kph sign (LHS) before Centenary Pavilion
11km	Grand Drive (RHS), 18.91m past stop sign (LHS) after junction with Musgrave St
12km	Grand Drive (RHS), 20.6m past no stopping sign on LHS
13km	Old Grand Dri, 17.70m past position level with east end of tennis court fence (LHS)
14km	Anzac Parade (LHS), 25.18m past tp.2182/SY08319 (LHS) after Alison Road
15km	Anzac Parade (LHS), 1.60m past tp.SY07829 (LHS) after Todman Ave (o/s Lembah)
16km	Anzac Parade (LHS), 2.76m past tp.SY10093 (LHS), outside Warrane College
17km	Anzac Parade (by median), 3.52m past tp.MA09287 (LHS) after Sturt St
18km	Anzac Parade (LHS), after turn, going north , 5.35m past tp.MA09877, o/s #521
19km	Anzac Parade (by median), 4.39m past direction sign for southbound carriageway
20km	Anzac Parade (LHS), 7.33m past tp.SY09744, o/s Caltex (after High St on RHS)
21km	Anzac Parade (LHS), 24.67m past tp.SY07854 (LHS)
halfway	Anzac Parade (LHS), 11.09m past tp.SY07850 (LHS)
22km	Anzac Parade (LHS), 23.75m past tp.SY16284, after overhead sign
23km	Anzac Parade (LHS), 5.94m past lp.T945/SY17042 (LHS), before overhead sign
24km	Oxford Street (LHS), 42.67m past first lp on LHS
25km	Bathurst Street (LHS), 8.96m past first lp T2233/SY21521 on LHS
26km	Western Distributor (LHS), 4.38m past lpNW181, before overhead direction sign
27km	Western Distributor (RHS), 13.15m past lp.895, starting climb to Anzac Bridge
28km	Western Distributor (LHS), 7.32m past traffic camera (RHS), after Anzac Bridge
29km	City West Link (LHS), 12.18m before last lp (RHS) before overhead sign
30km	City West Link (RHS), 4.41m past near edge of first drain (RHS) after Balmain Rd
31km	City West Link extn (RHS), 14.77m past lp.2634399 (RHS) 2nd after soundproofing
32km	City West Link extn (by median), 14.44m past traffic light before Dobroyd Parade
33km	Ramsay Street (RHS) 4.44m past tp.T281/LEO9752 (LHS) outside #172
34km	Queens Road (LHS), 1.94m past tp.LEO3790 (LHS) after Lavender Street
35km	Queens Road (RHS), 0.49m past lpT172 (LHS) opposite #146 & before Walker St
36km	Gipps Street (LHS) 3.05m before tp.LEO 3508 (LHS) before Broughton Street
37km	Sydney Street (RHS), 7.18m past tp.28422 (LHS) opposite Church
38km	M4 highway (RHS), 1.04m past paint mark (end of wall, before bridge)
39km	M4 highway (RHS), 5.22m before 4 th lp before 'mousehole' turnoff
40km	Olympic Blvd (LHS), 3.58m past lp.02039 (LHS)
41km	Dawn Fraser Ave (by centre line) 1.65m before lp10203 (LHS)
42km	Olympic Stadium track, 5m after 200m mark
FINISH	Olympic Stadium track finish line

(*) NOTE: The course is nominally 7.8m overdistance. All of this slightly increased margin of error (50m instead of 42.2m) is in the first, sharply downhill, kilometre.

Split mile positions

1 mile (1609.34m)	measure back 349.31m from #9 stanchion (using bike path?)
2 miles (3218.68m)	measure forward 201.39m from first overhead light after south pylon
3 miles (4828.03m)	measure back 145.47m from first gate to Parliament House
4 miles (6437.37m)	measure forward 453.14m from box 292 (College St / Francis St)
5 miles (8046.72m)	measure forward 69.53m from lp SY19758 (Flinders St / Hannam St)
6 miles (9656.06m)	measure forward 92.23m from 'media stop' paint mark near Park cafe
7 miles (11265.40m)	measure forward 284.31m from stop sign TF Musgrave St
8 miles (12874.75m)	measure back 107.55m from position level with east tennis court fence
9 miles (14484.09m)	measure forward 509.65m from tp 2182/SY08319 (Anzac Pde / Alison Rd)
10 miles (16093.44m)	measure forward 96.2m from tp SY10093 outside Warrane College
11 miles (17702.78m)	measure back 290.87m from tp.MA09877, o/s #521 Anzac Parade
12 miles (19312.12m)	measure forward 316.51m from overhead sign opp 'Elegans', Anzac Pde
13 miles (20921.47m)	measure back 53.86m from tp 07854, Anzac Parade
14 miles (22530.81m)	measure back 463.25m from lp T945/SY17042, Anzac Pde before o/head si
15 miles (24140.16m)	measure forward 182.83m from first lp after turning into Oxford Street
16 miles (25749.50m)	measure back 246.12m from lp NW181 on Western Distributor
17 miles (27358.84m)	measure forward 371.99m from lp 895 on W Distr. at start of Bridge climb
18 miles (28968.19m)	measure back 43.99m from last lp before overhead sign, City West Link
19 miles (30577.53m)	measure back 407.70m from lp 2634399, 2nd after soundproof wall ends
20 miles (32186.88m)	measure forward 201.32m from traffic light at Dobroyd Parade
21 miles (33796.22m)	measure back 20.84m from tp LEO3790 (Queens Rd / Lavender St)
22 miles (35405.56m)	measure forward 406.05 from lp T172 opp. #146 Queen's Road
23 miles (37014.91m)	measure forward 22.09m from tp 28422, Sydney St (opp. church)
24 miles (38624.25m)	measure back 380.97m from 4 th lp before mousehole
25 miles (40233.60m)	measure forward 237.18m from lp 02039, Olympic Blvd
26 miles (41842.94m)	measure back 52.12m in lane 5 from 1500m line on track

Also consider: 800m to go: 53.3m before yellow paint mark in gutter, approaching stadium tunnel

CALIBRATIONS

Edwin Flack Ave 500m calibration course in Olympic Park, 2000-08-19					
Pre-measurement at 07.30, 10.5C			Post-measurement at 10.00, 15.5C		
start	end	count	start	end	count
19000	23817	4817	42000	46813.5	4813.5
24000	28818	4818	47000	51814.5	4814.5
29000	33817	4817	52000	56813.5	4813.5
34000	38818	4818	57000	61816.5	4816.5
Average – 4817.5			Average – 4814.5		
$(x 2, x 1.001) = 9.644632/m$			$(x 2, x 1.001) = 9.638629/m$		
Constant for the Day = 9.641632/m – used for 39.5km-finish line					

Edwin Flack Ave 500m calibration course in Olympic Park, 2000-08-20

Pre-measurement at 06.30, 10.5C

start	end	count
87000	91819	4819
92000	96818.5	4818.5
97000	01819.5	4819.5
02000	06818.5	4818.5

Average – 4818.875

$(x 2, x 1.001) = 9.6473877/m$

No post-measurement calibration (punctured)

Hickson Road 500m calibration course in central Sydney, 2000-08-21					
Pre-measurement at 03.00, 11C			Post-measurement at 06.00, 10C		
start	end	count	start	end	count
87000	91784	4784	12000	16783.5	4783.5
92000	96785	4785	17000	21783.5	4783.5
97000	01785.5	4785.5	22000	26784	4784
02000	06785	4785	27000	31784.5	4784.5
Average – 4784.875			Average – 4783.875		
$(x 2, x 1.001) = 9.5793197/m$ apply multiplier			$(x 2, x 1.001) = 9.5773177/m$		
$(x 1.001689) = 9.595501/m$, then average with					
Constant for the Day: 9.5783185/m - to obtain:			9.5869095/m - used for 0-5km		

Edwin Flack Ave 500m calibration course in Olympic Park, 2000-08-21

Pre-measurement at 15.40, 20C

start	end	count
44000	48786	4786
49000	53788	4788
54000	58786.5	4786.5
59000	63788.5	4788.5

Average – 4787.25

$(x 2, x 1.001) = 9.5840745/m$

Constant for the Day **9.5854505/m** [Walks Lap Measurement]

Post-measurement at 17.00, 19C

start	end	count
07000	11787.5	4787.5
12000	16789	4789
17000	21788	4788
22000	26790	4790

Average – 4788.625

$(x 2, x 1.001) = 9.5863272/m$

Edwin Flack Ave 500m calibration
course in Olympic Park, 2000-08-22

Pre-measurement at 00.00, 11.5C

start	end	count
55000	59792.5	4792.5
60000	64793	4793
65000	69792.5	4792.5
70000	74793	4793

Average – 4792.75

(x 2, x 1.001) = 9.5950855/m

Constant for the Day : **9.5870775/m – used for 39.5km-24.5km**

Hickson Road 500m calibration
course in central Sydney, 2000-08-22

Post-measurement at 01.30, 12C

start	end	count
58000	62784	4784
63000	67785	4785
68000	72785	4785
73000	77785	4785

Average – 4784.75

(x 2, x 1.001) = 9.5790695/m

Hickson Road 500m calibration course
in central Sydney, 2000-08-23

Pre-measurement at 19.10, 16C

start	end	count
22000	26785	4785
27000	31785.5	4785.5
32000	36785	4785
37000	41786	4786

Average – 4785.375

(x 2, x 1.001) = 9.5803207/m

Hickson Road 300m calibration course
in central Sydney, 2000-08-23

Post-measurement at 19.25, 16C

start	end	count
47000	49871.5	2871.5
50000	52871.5	2871.5
53000	55871.5	2871.5
56000	58871.5	2871.5

Average – 2871.5

(x 3.3333, x 1.001) = 9.5812381/m

Comparative test calibration only

Edwin Flack Ave 500m calibration
course in Olympic Park, 2000-08-22

Pre-measurement at 23.25, 13C

start	end	count
98000	02792.5	4792.5
03000	07793.5	4793.5
08000	12793.5	4793.5
13000	17793.5	4793.5

Average – 4793.25

(x 2, x 1.001) = 9.5960865/m

Constant for the Day: **9.5882035/m –used for 5km-24.5km**

Hickson Road 500m calibration
course in central Sydney, 2000-08-23

Post-measurement at 02.00, 12C

start	end	count
75000	79785	4785
80000	84786	4786
85000	89784.5	4784.5
90000	94786	4786

Average – 4785.375

(x 2, x 1.001) = 9.5803207/m

Hickson Road 500m calibration
course in central Sydney, 2000-08-23

Pre-measurement at 00.05, 13C

start	end	count
28000	32786	4786
33000	37786	4786
38000	42785.5	4785.5
43000	47785.5	4785.5

Average – 4785.75

(x 2, x 1.001) = 9.5810715/m

Constant for the Day (comparative purposes only) : 9.5894545/m

Edwin Flack Ave 500m calibration
course in Olympic Park, 2000-08-23

Post-measurement at 02.30, 11.5C

start	end	count
08000	12794	4794
13000	17794	4794
18000	22794.5	4794.5
23000	22794	4794

Average – 4794.125

(x 2, x 1.001) = 9.5978382/m

COURSE MEASUREMENT SUMMARY SHEET

EVENT: ***THE GAMES OF THE XXVII OLYMPIAD
MEN'S & WOMEN'S 20km WALK, MEN'S 50km WALK***

LOCATION: ***SYDNEY*** DATE: ***2000-09-22, 28 & 29***

Promoting Organisation: ***SYDNEY ORGANISING COMMITTEE
FOR THE OLYMPIC GAMES (SOCOG)***

Name & Address of race director: ***Dave Cundy (Road Events Manager)
235 Jones St, Ultimo
NSW 2007, AUSTRALIA*** ***Dave_Cundy@socog.com.au
Tel: +61 2 9297 2000***

Distance: ***not less than 20km & 50km*** Measured by: ***Hugh Jones***
Dates: ***2000-08-19, 21***

Measurement method: ***Jones counter mounted on bicycle wheel, steel tape***

Elevation, if not same, of: START c.10m FINISH c.10m
Distance, in straight line, between start & finish: ***c.125m***

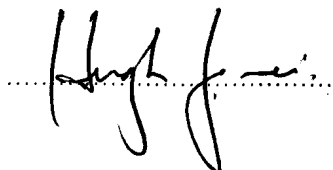
Description of the Course

- i) Terrain: ***Flat lap, slight slope down to lap from stadium***
- ii) Race surface: ***Tarmac city streets, and stadium track***
- iii) Course configuration: ***Five laps of track, then out-and back with 8 (20km) or 23 (50km) 2km laps in 'T' configuration***

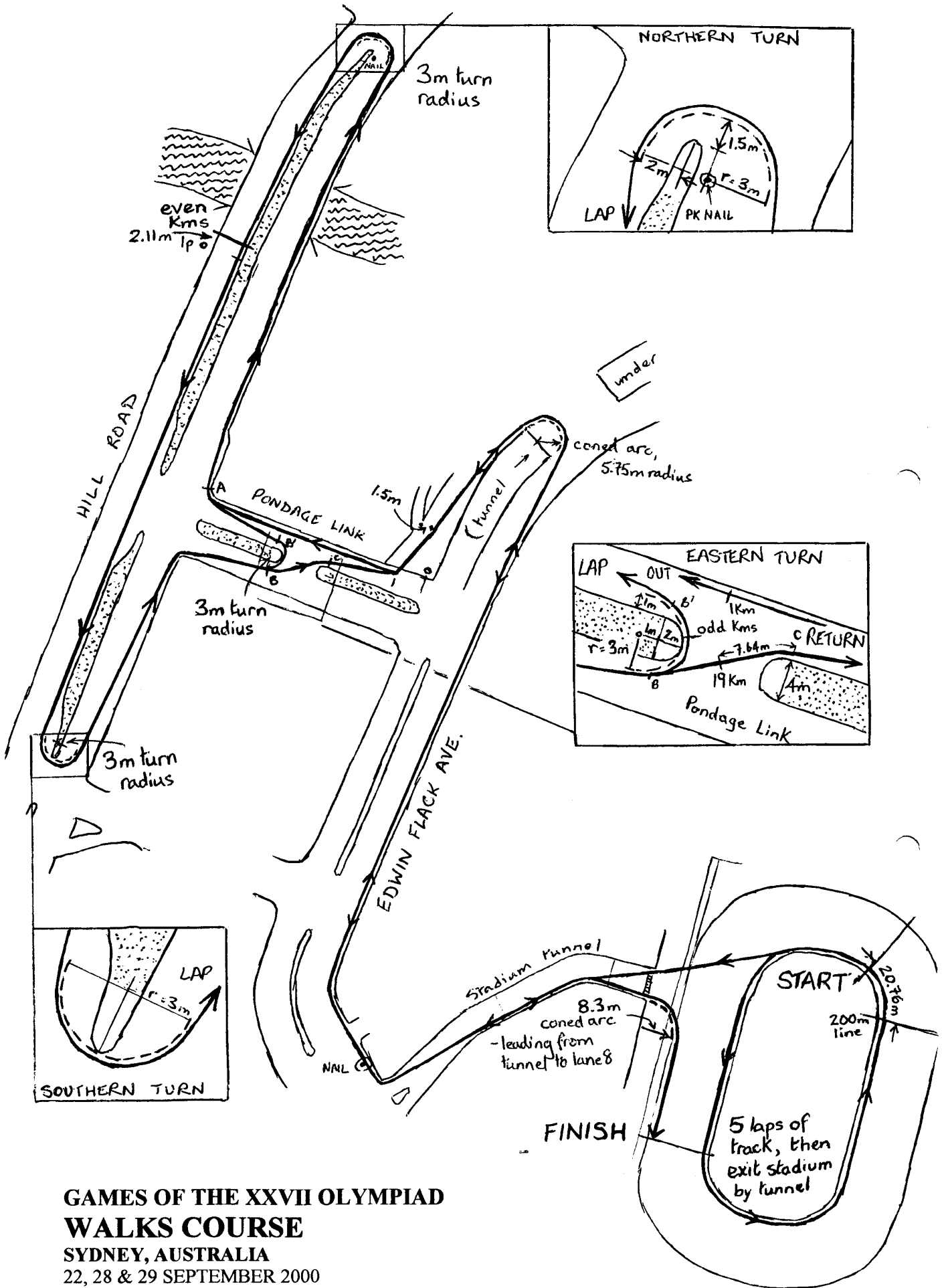
Measurement Details

- i) Section of road available: ***Entire width of track and tunnel, one carriageway only of roads from tunnel exit***
- ii) Line to be taken at turns: ***Shortest route available except: entry to stadium using 8.3m radius coned arc to lane 8; 5.75m radius coned over underpass; keeping 1.5m clearance to margin of hard surface at Edwin Flack Ave/Pondage Link turn; using 3m coned turns on 2km lap - see course map***

SIGNED:



DATE: ***2000-08-30***



GAMES OF THE XXVII OLYMPIAD
WALKS COURSE
 SYDNEY, AUSTRALIA
 22, 28 & 29 SEPTEMBER 2000

GAMES OF THE XXVII OLYMPIAD – WALKS COURSE

SYDNEY, AUSTRALIA

MEN'S 20km: 22 September 2000

WOMEN'S 20km: 28 September 2000

MEN'S 50km: 29 September 2000

The same 2km lap will be used for the women's 20km walk and the men's 20km and 50km walks. For all events the same start and finish sections will be used, and after the start five laps of the track will be completed before exiting through the stadium tunnel. To adjust the proposed courses to an exact distance there are two points to adjust: the starting position - to ensure that from start to finish around a single lap equals 4km; and one of the turning points on the lap - to ensure that one complete lap equals 2km. Then the 20km walks require completion of eight laps and the 50km walk requires 23 laps. In each case, one of these laps will not be quite complete, as walkers depart from the lap marginally before the point at which they originally joined it.

Using the 200m mark on the track as a start reference point, we measured a lap (for interest only) and then exited through the stadium tunnel. Another reference was taken at the nail marking the northern end of the Edwin Flack Ave. calibration course.

We continued the outward measurement past the Sydney Superdome to make a 180 degree turn back over the opposite carriageway, which at this point lies in a tunnel underneath. Instead of taking this turn as two 90-degree corners we prescribed a coned constant turning radius of 5.75m (the out and back routes being separated by 11.5m).

Making the next, right-hand turn on to Pondage Link, two positions were defined (see map detail). Walkers must keep to the right of these, in order to allow for pedestrian circulation in the area. The lap is joined part way down Pondage Link, but the SPR of the lap and of the outward path only converge at the corner with Hill Road. A reference was taken here. We rode the lap, observing chalked turning circles at either end, and then took a reference at a point just before the SPR of the lap diverges from the return path to the stadium.

Although a gap in the median exists at this point, it has been blocked with tarmac and curbing. It was necessary to tape to a position 12.15m closer to the stadium to allow for the return path to the stadium to be picked up, and also to measure the radius of the turning circle so that the distance covered in the 180-degree turn could be calculated. We then resumed and completed the lap measurement.

Returning to the measured point 12.15m distant from the point where walkers leave the lap, we measured from here back to the nail at the northern end of the calibration course. From here we rode back into the stadium, directly to the finish line except for observing a coned turning radius of 8.3m which guides walkers from the tunnel exit into lane 8 of the track on the home straight.

The two basic elements to the measurement could then be calculated: a single lap of the course in isolation and the out-and-back combined with a single lap. Adjustment of the first to 2km and the second to 4km allowed a course to be fixed which would accommodate both race distances required (20km and 50km). The theoretical adjustment was subjected to a final check measurement ride.

During final measurement of the lap a reference was noted half way around the lap from which to calculate the position of even split kilometres.

Distance elapsed from start at Point C (after completion of a single lap)
= $4000\text{m} - (3192+6376)/9.641632$ (= 992.36m)
= 3007.64m

Position of 1km to go point (19km/49km): 7.64m before point C (or 4.51m after Point B)

Distance elapsed from start at Point B (after completion of a single lap) = 2995.49m [C-12.15m]

Distance elapsed from start at apex of turn = 2999.67m [increment from B = $(3.3\pi - 2)/2$]

Position of odd kilometre splits: 0.33m after apex of turn in Pondage Link

Distance elapsed from start at lp reference = $(2995.49 - 993.38) = 2002.11\text{m}$

Position of even kilometre splits: 2.11m before lp reference, Hill Road

Measurement data – layout ride

reading	counts	distance	location
42000			200m mark on track
45845	3845	398.8m (<i>lap distance</i>)	200m mark on track
49228	3383	350.87m	Calibration course nail on Edwin Flack Ave
RESTART			
05000			Calibration course nail on Edwin Flack Ave
13397	8397	870.91m	Corner Pondage Link / Hill Road (A)
30661	25661] 2661.47m	point of departure from lap (B)
	+ 7.22m]]	length of turnaround arc BB' (calculated – 2.3 x pi)
30661] 1996.09m LAP	- <i>provisional measurement, see below, 'Final Lap Measurement'</i>
32573	1912]]	completion of lap to Pondage Link / Hill Road
		+ 12.15m	taped section leaving lap (BC)
RESTART			
36000			Point C
42376	6376	661.30m	Return to nail from point C
RESTART			
05000			Nail, Edwin Flack Ave
53192	3192	<u>331.06m</u>	stadium finish line
		4016.86m	Because the lap must be extended by 3.9m, the lap + out-and-back is likewise lengthened, so the distance to be removed at the start becomes 20.76m

Final lap measurement

We returned to measure the slightly amended walk lap on the afternoon of Monday 21 August. We chalked the positions intended for the lines of cones at each turn and measured with a 300mm offset from them.

reading	counts	distance	location
83000	00000		Point B
92552	9522	993.38m	lp reference for even kms
00197	17197	1794.07m	Point A, Hill Rd / Pondage Link
02098	19098	1992.39m	Point B'
		+ 7.22m (taped)	Point B
		1999.61m	

The lap was further extended by increasing the coned radius of the turning arc BB' from 2m to 3m, in common with the northern and southern turning points of the lap.

The running path then increases by: $(1\text{m} \times \pi) - 2\text{m} = 1.14\text{m}$

This increase brought my measurement of the lap to **2000.75m**, and also increased the measurements of Dave Cundy and Norrie Williamson to just over 2000m. This lap length was fixed and taken as 2000m.

The position of the start was fixed as 20.76m past the 200m line on the stadium track.

CALIBRATIONS

Edwin Flack Ave 500m calibration course in Olympic Park, 2000-08-19

Pre-measurement at 07.30, 10.5C

start	end	count
19000	23817	4817
24000	28818	4818
29000	33817	4817
34000	38818	4818

Average – 4817.5

(x 2, x 1.001) = 9.644632/m

Constant for the Day = **9.641632/m** – used for start to lap & lap to finish line

Post-measurement at 10.00, 15.5C

start	end	count
42000	46813.5	4813.5
47000	51814.5	4814.5
52000	56813.5	4813.5
57000	61816.5	4816.5

Average – 4814.5

(x 2, x 1.001) = 9.638629/m

Edwin Flack Ave 500m calibration course in Olympic Park, 2000-08-21

Pre-measurement at 15.40, 20C

start	end	count
44000	48786	4786
49000	53788	4788
54000	58786.5	4786.5
59000	63788.5	4788.5

Average – 4787.25

(x 2, x 1.001) = 9.5840745/m

Constant for the Day = **9.5854505/m** used for walks lap measurement

Post-measurement at 17.00, 19C

start	end	count
07000	11787.5	4787.5
12000	16789	4789
17000	21788	4788
22000	26790	4790

Average – 4788.625

(x 2, x 1.001) = 9.5863272/m

EDWIN FLACK AVENUE CALIBRATION COURSE

OLYMPIC PARK, SYDNEY, AUSTRALIA

500.000m

Measured on 2000-08-22, once, using a steel tape tensioned to 50N, by:

Dave Cundy, Norrie Williamson and Hugh Jones

Duties of: holding tape to mark, tensioning tape and making mark

The course is straight, flat, and on smooth tarmac

It is marked at either end by nails close to the kerb.

Altitude: c.12m

STEEL TAPING DATA:

Start time: 12.05, @ 19C Finish time: 12.20, @ 19.5C Average temp = 19.25C

i) First (only) measurement:

tape lengths of 90m + 40m + 70m + 100m + 100m + 100.023m

ii) Uncorrected measurement of course = 500.023m

$$\begin{aligned}\text{iii) Correction factor} &= 1 + [0.0000116 \times (19.25-20)] \\ &= 1 - 0.0000087 \\ &= 0.9999913\end{aligned}$$

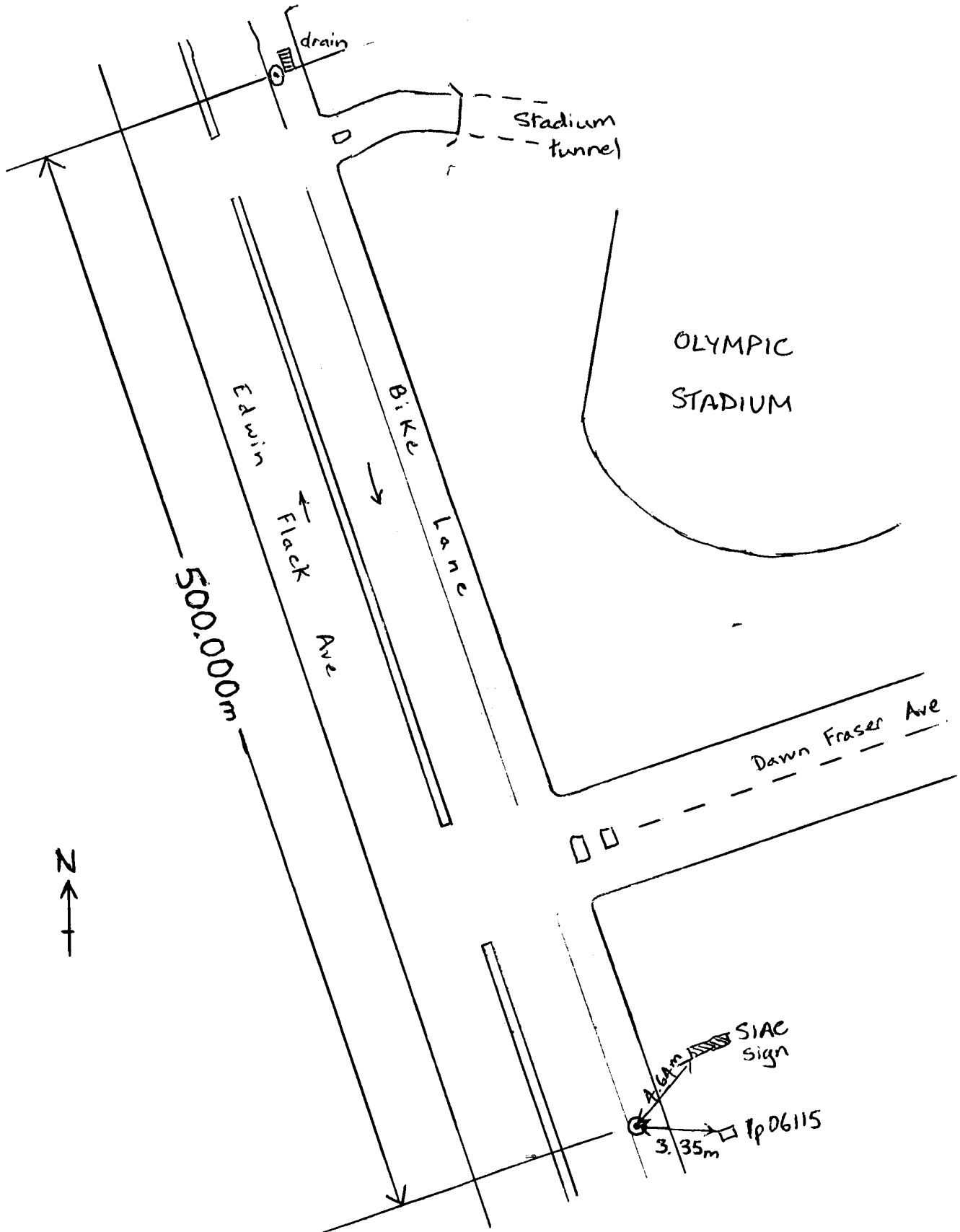
$$\begin{aligned}\text{iv) Corrected measurement} &= \text{uncorrected measurement} \times \text{correction factor} \\ &= 500.023\text{m} \times 0.9999913 \\ &= 500.018\text{m}\end{aligned}$$

v) This measurement check confirms that the calibration course does measure 500.000m within accepted margins of error.

EDWIN FLACK AVENUE CALIBRATION COURSE

OLYMPIC PARK, SYDNEY, AUSTRALIA

500.000m



HICKSON ROAD CALIBRATION COURSE

SYDNEY, AUSTRALIA

500.000m

Measured on 2000-08-18 & 2000-08-22, using a steel tape tensioned to 50N, by:
Mike Wickiser and Hugh Jones (18/08)
Dave Cundy, Norrie Williamson and Hugh Jones (22/08)

The course is flat, has a slight bend and is on tarmac.
It is marked at either end by nails offset from the kerb. The rider must stay clear of parked vehicles along the side of the road when calibrating.

Altitude: c.2m

STEEL TAPING DATA:

i) First measurement: Start time: 14.00, Finish time: 14.20, Average temp = 18C
5 tape lengths of 100m + 0.03m

ii) Uncorrected measurement of course = 500.030m

$$\begin{aligned}\text{iii) Correction factor} &= 1 + [0.0000116 \times (18-20)] \\ &= 1 - 0.0000232 \\ &= 0.9999768\end{aligned}$$

$$\begin{aligned}\text{iv) Corrected measurement} &= \text{uncorrected measurement} \times \text{correction factor} \\ &= 500.030\text{m} \times 0.9999768 \\ &= \mathbf{500.018\text{m}}\end{aligned}$$

i) Second measurement: Start time:14.05, Finish time:14.15, Average temp = 20.5C
4 tape lengths of 100m + 100.010m

ii) Uncorrected measurement of course = 500.010m

$$\begin{aligned}\text{iii) Correction factor} &= 1 + [0.0000116 \times (20.5-20)] \\ &= 1.0000058\end{aligned}$$

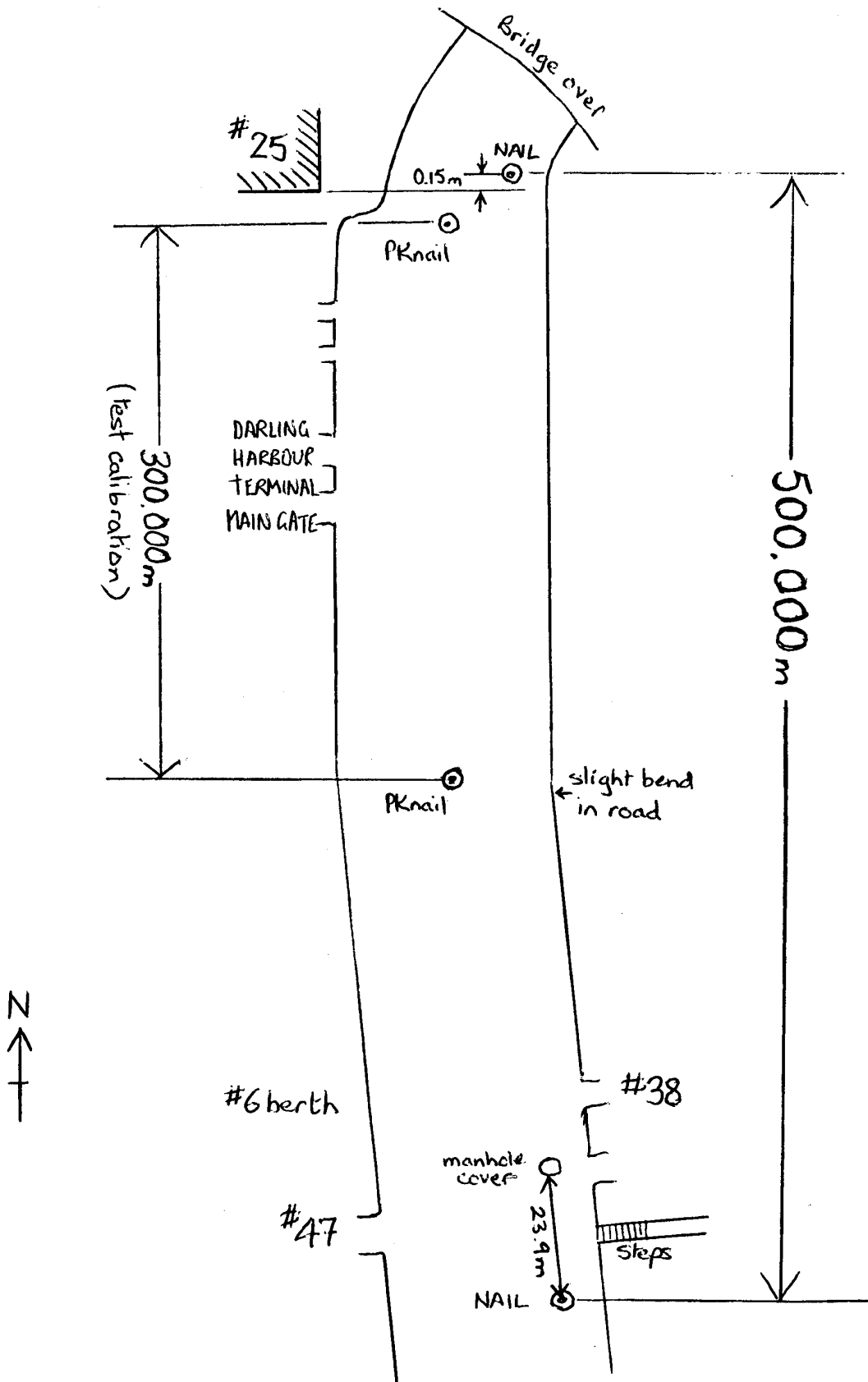
$$\begin{aligned}\text{iv) Corrected measurement} &= \text{uncorrected measurement} \times \text{correction factor} \\ &= 500.010\text{m} \times 1.0000058 \\ &= \mathbf{500.013\text{m}}\end{aligned}$$

v) These measurement checks confirm that the calibration course does measure 500.000m within accepted margins of error

HICKSON ROAD CALIBRATION COURSE

SYDNEY, AUSTRALIA

500.000m



Measurements of Sydney Olympic Marathon Course - 19 to 21 August 2000

This file contains data obtained post-measurement from Norrie Williamson, Mike Wickiser and Dave Cundy.

Name	Hugh	Mike	Dave	Fran	Bob	Norrie	Steven	Peter	Geoff
precal - 19 Aug, 07:30									
	4817	4825	5521	5482	5668	5630.5	5694		
Edwin Flack 500 meters	4818	4825	5519	5483.5	5667	5631.5	5695		
	4817	4825	5521	5482.5	5667	5630.5	5694		
	4818	4824	5522	5484	5666.5	5631.5	5695		
postcal - 19 Aug, 10:00									
	4813.5	4823	5520	5476.5	5660	5628.5	5690		
Edwin Flack 500 meters	4814.5	4822.5	5522	5478	5660	5628.5	5690		
	4813.5	4822.5	5521	5476.5	5660	5626	5689		
	4816.5	4822	5521	5477.5	5659	5628.5	5691		
Counts Obtained									
Finish Line	58000	58000	37876	237000	696100	154630	778072		
41km- LP 10203	69506	69526	51075	250102	709614	168077	791680		
40km LP 02039	79198		62177	261138	720998	179406.5	803138		
End restricted post	84564					185677			
Red Dot	84697	84735	68481	267414	727455	185833.5	809645		
Marathon course Day 2									
precal - 20 Aug									
	4819	4826	5522	5484.5	5640	5632.5	5686	4810	5577.5
Edwin Flack 500 meters	4818.5	4825.5	5523	5484	5639	5633	5686	4809	5577
	4819.5	4824.5	5523	5484.5	5639.5	5633	5688	4811	5578
	4818.5	4826	5523	5484.5	5639.5	5632	5686	4811	5577
postcal - 20 Aug									
		4821	5527	5474.5		5625	5675	4801	5567.5
Hickson Road 500 meters		4819	5527	5473		5626.5	5675	4798	5566
		4820	5527	5474.5		5625	5675	4799	5566
		4819	5527	5474.5		5623	5675	4799	5565
Counts Obtained									
Red Dot	25000	12800	211000	416000	878900	331556	948832	35760	960720
	35	67671	55534	259904	464595.5	928818	381454	999196	78363
	30	115914	103857	315209	519546.5	985273	437867.5	1056147	126537
	25	164165	152189	370488	574478	1041741.5	494282	1113095	174723
	21.0975	201804	189891	413646	617334.5	1085813	538286	1157529	212316
	20	212342	200448	425735	629332.5	1098151	550606	1169966	222849
	15	260460	248656	480919	684095.5	1154480	606885	1226763	270906
at Lang / Driver ramp	279060	267289	502258	705264.5		628628	1248717		1254757
27 m addon (taped)									
at Lang / Driver ramp -restart measure	279060	267289	502556	705661	1165742	628628	1248717		1255000
10km	308541	296820	536373	739098	1200539	663086	1283820	318893	1289106
Media stop	312556	300844	540979	743666	1205275	667782			
5km Parliament	356784	345158	591713	793981	1257474	719495	1340748	367069	1344909
Hugh Puncture			597962			725868			
4km			602797			730793			
3km			613327			741527			
2km			625033			753456			
1km			636020			764640			
start		393146	646676	848469	1314051	775511	1397287	414895	1400315

Above are data only, and include no calculations except for the computation of individual calibration ride counts

Below are calculations only (By Pete Riegel) and include no data

Name	Hugh	Mike	Dave	Fran	Bob	Norrie	Steven	Peter	Geoff
Aug 19 constant (with SCPF)	9641.632	9656.897	11052.792	10971.085	11338.202	11270.134	11395.885		
Aug 20 constant (with SCPF)		9654.895	11060.800	10969.459		11268.758	11372.862	9619.110	11154.644
Total Finish to Red Dot, meters	2768.9	2768.5	2769.0	2772.2	2765.4	2768.7	2770.6		
Total Red Dot to Start, meters		39421.1	39389.3	39415.7		39424.0	39459.0	39441.8	39414.4
Total course		42189.6	42158.2	42187.9		42192.7	42229.6		

Whole Course Measurements	
Dave	42158.2
Mike	42189.6
Norrie	42192.7
Fran	42187.9
Steven	42229.6

Later Measurements by Hugh & Norrie	
Norrie	42190.6 Calculated by Norrie
Hugh	42198.7 Calculated by Norrie
Hugh	42193.8 Calculated by Hugh

This is not a final result, as all data and results have not been examined by all measurers. Contributions are solicited.

SUPPLEMENTARY CALCULATIONS

Name	Hugh	Mike	Dave	Fran	Bob	Norrie	Steven	Peter	Geoff
Meters obtained 19 Aug									
Finish Line									
Red Dot	2768.9	2768.5	2769.0	2772.2	2765.4	2768.7	2770.6		
Meters obtained 20 Aug									
Red Dot									
	35	4426.1	4421.4	4430.1		4428.0	4428.4	4429.0	4427.3
	30	5005.0	5000.1	5009.5		5006.2	5007.6	5008.2	5007.2
	25	5006.0	4997.7	5007.7		5006.3	5007.4	5009.4	5004.7
	21.0975	3905.0	3901.9	3906.9		3905.0	3907.0	3908.2	3905.6
	20	1093.4	1093.0	1093.8		1093.3	1093.6	1095.0	1093.2
	15	4993.1	4989.2	4992.3		4994.3	4994.1	4996.0	4992.4
at Lang / Driver ramp		1929.9	1929.2	1929.8		1929.5	1930.4		1929.6
27 m addon (taped)	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0
at Lang / Driver ramp -restart measure									
10km		3058.7	3057.4	3048.2		3057.8	3086.6		3057.6
5km Parliament start		5006.6	5003.3	5003.3		5005.8	5005.6	5008.4	5002.7
		4970.3	4969.2	4967.2		4970.9	4971.4	4972.0	4967.1
Whole Course		42189.6	42158.2	42187.9		42192.7	42229.6		

CALIBRATIONS

Precal Aug 19	9644.635	9659.150	11052.542	10976.966	11345.584	11273.262	11400.389		
Postcal Aug 19	9638.629	9654.645	11053.042	10965.204	11330.820	11267.006	11391.380		
Change, counts/km	-6.0	-4.5	0.5	-11.8	-14.8	-6.3	-9.0		
Precal Aug 20	9647.388	9660.651	11056.546	10979.719	11290.279	11276.515	11384.373	9630.121	11165.905
Postcal Aug 20		9649.140	11065.054	10959.198		11261.000	11361.350	9608.099	11143.382
Change, counts/km		-11.5	8.5	-20.5		-15.5	-23.0	-22.0	-22.5

	Marathon	Equivalent 10 km
Dave	42158.2	9991.3
Fran	42187.9	9998.3
Mike	42189.6	9998.7
Norrie	42190.6	9999.0
Norrie	42192.7	9999.4
Hugh	42198.7	10000.9
Steven	42229.6	10008.2

Finish Line to Red Dot

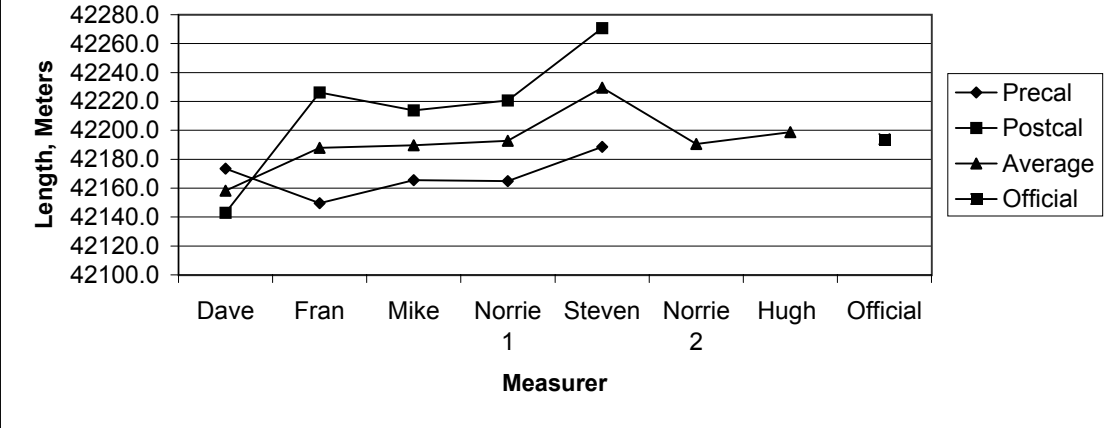
Counts	26697	26735	30605	30414	31355	31203.5	31573
Precal	9.644635	9.6591495	11.052542	10.976966	11.345584	11.273262	11.400389
Postcal	9.638629	9.654645	11.053042	10.965204	11.33082	11.267006	11.39138
Average	9.641632	9.6568973	11.052792	10.971085	11.338202	11.270134	11.395885
By precal	2768.0674	2767.842	2769.0464	2770.711	2763.6303	2767.9211	2769.4669
By postcal	2769.7923	2769.1334	2768.921	2773.6829	2767.2314	2769.4581	2771.6572
By average	2768.9296	2768.4876	2768.9837	2772.1962	2765.4297	2768.6894	2770.5616

Red Dot to Start

Counts	380346	435378	432072.5	443955	448455	379135	439352
Precal	9.660651	11.056546	10.979719	11.276515	11.384373	9.6301205	11.165905
Postcal	9.6491395	11.065054	10.959198	11.261	11.36135	9.6080985	11.143382
Average	9.6548953	11.0608	10.969459	11.268758	11.372862	9.6191095	11.154644
By precal	39370.639	39377.399	39351.873	39369.875	39392.156	39369.705	39347.64
By postcal	39417.608	39347.119	39425.557	39424.12	39471.982	39459.941	39427.168
By average	39394.109	39362.253	39388.681	39396.979	39432.029	39414.771	39387.364

	Hugh	Mike	Dave	Fran	Bob	Norrie	Steven	Peter	Geoff
Total by Precal		42165.481	42173.445	42149.584		42164.796	42188.623		
Total by Postcal		42213.742	42143.04	42226.24		42220.578	42270.639		
Total by Average		42189.597	42158.237	42187.877		42192.668	42229.59		
	Mike	Dave	Fran	Norrie	Steven				
Total by Precal	42165.481	42173.445	42149.584	42164.796	42188.623				
Total by Postcal	42213.742	42143.04	42226.24	42220.578	42270.639				
Total by Average	42189.597	42158.237	42187.877	42192.668	42229.59				
Measurer	Precal	Postcal	Average	Official					
Dave	42173.4	42143.0	42158.2						
Fran	42149.6	42226.2	42187.9						
Mike	42165.5	42213.7	42189.6						
Norrie 1	42164.8	42220.6	42192.7						
Steven	42188.6	42270.6	42229.6						
Norrie 2			42190.6						
Hugh			42198.7						
Official				42193.8					

Olympic Marathon Measurements



Measurer	Precal	Postcal	Average	Official
Dave	42173.4	42143.0	42158.2	
Fran	42149.6	42226.2	42187.9	
Mike	42165.5	42213.7	42189.6	
Norrie 1	42164.8	42220.6	42192.7	
Steven	42188.6	42270.6	42229.6	
Norrie 2			42190.6	
Hugh			42198.7	
Official				42193.8