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Results of the National GNSS CORS Campaign, September 2014

G. Hu, A. Riddell and J. Dawson

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Expiry of this Report

5 years after authorisation date.

Abbreviations

AFN	Australian Fiducial Network
ARGN	Australian Regional GNSS Network
CORS	Continuously Operating Reference Station(s)
GDA94	Geocentric Datum Australia 1994
GNSS	Global Navigation Satellite System(s)
GPS	Global Positioning System
GRS80	Geodetic Reference System 1980
IGS	International GNSS Service
ITRF	International Terrestrial Reference Frame
ITRF92	International Terrestrial Reference Frame 1992
ITRF2008	International Terrestrial Reference Frame 2008

Introduction

An Australian-wide certification campaign of positions in accordance with Regulation 13 of the National Measurement Regulations 1999 and the National Measurement Act 1960 has been run from 00:00:00 (UTC time) Sunday 07 September 2014 to 00:00:00 (UTC time) Sunday 14 September 2014 (GPS week 1809). The primary objective of this campaign was to improve the consistency of legally traceable CORS positions across Australia, and confirm that CORS stations with a valid Regulation 13 Certificate conform to their stated uncertainties. As of 30 November 2014, twelve applications for verification of a reference standard of measurement under Regulation 12 of the National Measurement Regulations 1999 have been received for verification of GDA94 position on their owned or managed station monuments. This report documents the processing and analysis of the national Regulation 13 campaign GPS data for the stations to satisfy the position verification requirements.

Measurand

Station position, at the time of measurement and stated instrumentation, of a GPS monument with respect to the Geocentric Datum of Australia (GDA94) referred to the GRS80 ellipsoid being in the ITRF92 reference frame at the epoch 1994.0.

Measurand Traceability

Measurement traceability was ensured by comparing the computed solution against the recognised value standard for position of the Australian Fiducial Network stations. Additionally, the computed solution was checked against the ITRF based solutions computed by the IGS and the individual global analysis centres of the IGS. The validity and traceability of the entire GPS system was ensured via its link to the global Satellite Laser Ranging (SLR) and Very Long Baseline Interferometry (VLBI) observing networks through the ITRF. The validity and traceability of our internal computation processes were ensured by undertaking standard benchmark analysis prior to this analysis.

Measurand Uncertainty

Position uncertainties were calculated in accordance with the principles of the ISO Guide to the Expression of Uncertainty in Measurement (1995), with an interval estimated to have a confidence level of 95% at the time of verification. The combined standard uncertainty was converted to an expanded uncertainty using a coverage factor, *k*, of 2.

Type A uncertainty sources were evaluated by adopting an *a priori* sigma of **0.001** metre for the precision (1 sigma) of the L1-frequency, one-way, phase observation, at zenith. The corresponding uncertainties of all parameters were determined, by standard error propagation theory, in the least-squares estimation process used in the GPS analysis. Since the formal (internal) precision estimates of GPS solutions are well known to be optimistic, a factor of **10** (i.e. variance scale factor of 100) was subsequently applied to the variance-covariance matrix of the computed GDA94 coordinates.

Type B uncertainty sources, which in practice contribute to position uncertainty, cannot be estimated from the statistical analysis of short-period (i.e. 7-day) observations; these include environmental

effects, such as long-period station loading (deformation) processes. Table 1 shows the major type B uncertainty sources for GPS analysis.

Table 1: Type B uncertainty sources (95% C.L.) for position, determined from GPS, and the total uncertainty, assuming the normal distribution of the uncertainty sources, high degrees of freedom and a coverage factor, k, of 2.

Uncertainty Source	Position Uncertainty Horizontal (mm)	Position Uncertainty Vertical (mm)
Antenna phase centre	3	10
Monument stability	1	1
Other sources including un-modelled crustal loading, satellite orbit variations, atmosphere, tectonics, signal multi-path	6	10

GPS Data

GPS RINEX data was supplied for the campaign week from twelve clients for the 2014 Regulation 13 Campaign. There are total 539 stations submitted, of which 138 stations are new stations and stations with meta data changes when comparing with the existing certificates. Figure 1 shows the locations of the 539 stations. Tables 2 – 10 list the GPS receiver and antenna type for the new stations and stations with meta changes when comparing with the existing certificates. The AFN/ARGN/IGS network sites used in the GPS data processing are plotted in Figure 1. Table 11 lists the GPS receiver and antenna type used in the GPS data processing for each of the AFN/ARGN/IGS network sites. Table 12 lists the GPS antenna heights to the Antenna Reference Point (ARP) used in the GPS data processing for the AFN/ARGN/IGS stations. The ARP is the reference point as defined by IGS and the RINEX specifications. Tables 13 - 21 list the GPS antenna heights to the Antenna Reference Point (ARP) used in the GPS data processing for the campaign stations. Note that only those of new stations and stations with meta data updated are listed in the above tables. Others please refer to the last year's analysis report: Hu, G. & Dawson, J. 2013. *Results of the National GNSS CORS Campaign, June 2013.* Record 2013/43. Geoscience Australia: Canberra.

GPS Data Irregularities

Note that there is no solution for the five stations (MRT1, MUSW, MIDG, MIRA and TALO) submitted by CR Kennedy because of poor quality of data.

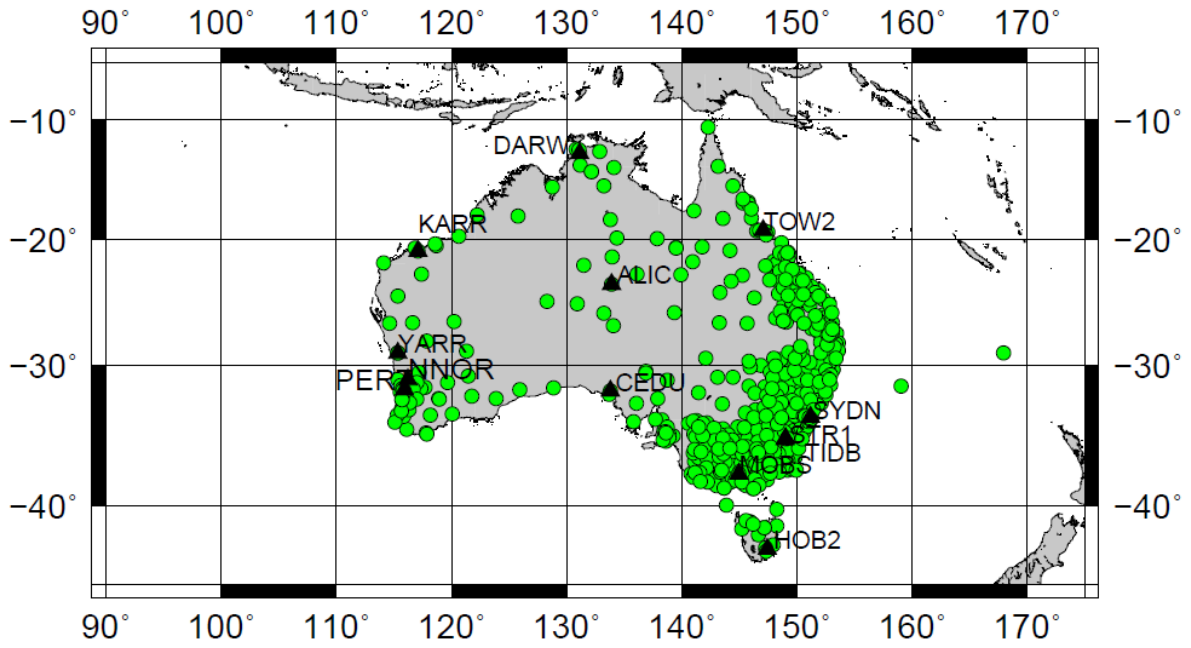

Figure 1: Stations of the campaign week (circles) and AFN/ARGN/IGS (black triangles) stations used in GPS data processing.

Table 2: GPS receiver and antenna types for the new station submitted by RPS Australia East Pty Ltd.

Station	GPS receiver type	GPS antenna serial number	IGS antenna type and dome type
IPSR	TRIMBLE NETR9	4611118879	TRM57971.00 NONE

Table 3: GPS receiver and antenna types for the new stations and stations with meta data changes submitted by Department of Natural Resources and Mines, Queensland.

Station	GPS receiver type	GPS antenna serial number	IGS antenna type and dome type
ARMC	TRIMBLE NETR9	5317354665	TRM59800.00 NONE
EDSV	TRIMBLE NETR9	5116354141	TRM59800.00 NONE
ERMG	TRIMBLE NETR9	5338354864	TRM59800.00 NONE
GGTN	TRIMBLE NETR9	5338354828	TRM59800.00 NONE
KILK	TRIMBLE NETR9	5115354097	TRM59800.00 NONE
MTIS	TRIMBLE NETR9	5225354538	TRM59800.00 NONE
NEBO	TRIMBLE NETR9	5241354612	TRM59800.00 NONE
NMTN	TRIMBLE NETR9	5222354500	TRM59800.00 NONE
TMBO	TRIMBLE NETR9	5320354680	TRM59800.00 NONE

Table 4: GPS receiver and antenna types for the new stations and stations with meta data changes submitted by Land and Property Information, NSW.

Station	GPS receiver type	GPS antenna serial number	IGS antenna type and dome type
BANK	TRIMBLE NETR5	31051332	TRM57971.00 NONE
BATH	TRIMBLE NETR9	5115354140	TRM59800.00 SCIS
BING	TRIMBLE NETR9	5112354079	TRM59800.00 SCIS

Station	GPS receiver type	GPS antenna serial number	IGS antenna type and dome type
BRWN	LEICA GR25	13286-038	LEIAR10 NONE
CNDA	LEICA GR25	13194-095	LEIAR10 NONE
NYMA	LEICA GR25	13286-036	LEIAR10 NONE
PRCE	TRIMBLE NETR9	5220354489	TRM59800.00 NONE
QUAM	LEICA GR25	15169072	LEIAR10 NONE
TLPA	TRIMBLE NETR9	5109354043	TRM59800.00 SCIS
WLWN	TRIMBLE NETR5	5112354072	TRM59800.00 SCIS
WTCF	LEICA GR25	13194-013	LEIAR10 NONE

Table 5: GPS receiver and antenna types for the new stations and stations with meta data changes submitted by C.R. Kennedy Survey Solutions.

Station	GPS receiver type	GPS antenna serial number	IGS antenna type and dome type
1770	LEICA GR10	12261105	LEIAS10 NONE
BDMR	LEICA GR10	12261095	LEIAS10 NONE
BER2	LEICA GRX1200+GNSS	8460051	LEIAX1203+GNSS NONE
BIND	LEICA GR10	12261135	LEIAS10 NONE
BODD	TRIMBLE NETR9	1441107171	TRM55971.00 NONE
BSOA	LEICA GX1230GG	07170077	LEIAX1202GG NONE
CALO	TRIMBLE NETR5	30604565	TRM41249.00 NONE
CANN	LEICA GRX1200GGPRO	08120009	LEIAX1202GG NONE
CBTN	LEICA GRX1200+GNSS	11181034	LEIAS10 NONE
CDWL	LEICA GR10	13411004	LEIAS10 NONE
COOR	LEICA GR10	12291048	LEIAS10 NONE
CRKP	LEICA GRX1200+GNSS	11401032	LEIAS10 NONE
CRNS	LEICA GRX1200+GNSS	10191058	LEIAS10 NONE
CROY	LEICA GRX1200+GNSS	11331043	LEIAS10 NONE
DWSN	LEICA GR10	12261082	LEIAS10 NONE
GDNV	LEICA GR10	13411016	LEIAS10 NONE
GRST	LEICA GRX1200+GNSS	11071047	LEIAS10 NONE
HBG1	LEICA GRX1200+GNSS	11501026	LEIAS10 NONE
INJN	LEICA GR10	12261093	LEIAS10 NONE
INSF	LEICA GR10	12291128	LEIAS10 NONE
KNWR	LEICA GR10	12261134	LEIAS10 NONE
KTHA	LEICA GR10	12261056	LEIAS10 NONE
LNGR	LEICA GRX1200GGPRO	08470011	LEIAX1202GG NONE
LONG	LEICA GR10	12261090	LEIAS10 NONE
MAMR	LEICA GR10	12291050	LEIAS10 NONE
MAND	TRIMBLE NETR5	1441021241	TRM55971.00 NONE
MCKN	LEICA GRX1200+GNSS	13411067	LEIAS10 NONE
MIRI	LEICA GR10	12261087	LEIAS10 NONE
MNDU	LEICA GRX1200GGPRO	06360003	LEIAX1202GG NONE
MNTO	LEICA GR10	12291047	LEIAS10 NONE

Station	GPS receiver type	GPS antenna serial number	IGS antenna type and dome type
MOLY	LEICA GR10	13411024	LEIAS10 NONE
MRT2	LEICA GR10	14071053	LEIAS10 NONE
MRT3	LEICA GR10	14071058	LEIAS10 NONE
NANT	LEICA GR10	12261061	LEIAS10 NONE
NHAV	LEICA GRX1200+GNSS	13341004	LEIAS10 NONE
PAIN	LEICA GRX1200+GNSS	11331019	LEIAS10 NONE
PKNH	LEICA GR10	12261064	LEIAS10 NONE
RLST	LEICA GR10	01226110	LEIAS10 NONE
ROCK	LEICA GR10	12261102	LEIAS10 NONE
ROMA	LEICA GX1230GG	06200159	LEIAX1202GG NONE
ROSE	LEICA GR10	12261089	LEIAS10 NONE
RSWT	LEICA GRX1200+GNSS	19440066	LEIAX1203+GNSS NONE
STLW	LEICA GR10	12291032	LEIAS10 NONE
TCC1	TRIMBLE NETR5	31050537	TRM57971.00 NONE
TORQ	LEICA GRX1200+GNSS	10461035	LEIAS10 NONE
TRUG	LEICA GR10	12291031	LEIAS10 NONE
WNBL	LEICA GR10	13031020	LEIAS10 NONE
WOLL	LEICA GRX1200+GNSS	12261073	LEIAS10 NONE
WURD	LEICA GRX1200+GNSS	10451042	LEIAS10 NONE
YRBE	TRIMBLE SPS852	1441132263	TRM57971.00 NONE

Table 6: GPS receiver and antenna types for the new stations and stations with meta data changes submitted by Position Partners Pty Ltd.

Station	GPS receiver type	GPS antenna serial number	IGS antenna type and dome type
2CBK	TOPCON NET-G3A	762-10921	TPSCR.G5 TPSH
2CCK	TOPCON NET-G3A	762-11131	TPSCR.G5 TPSH
2CHL	TOPCON NET-G3A	618-02275	TPSCR.G5 TPSH
2COW	TOPCON NET-G3	383-2167	TPSCR.G3 TPSH
2ERS	TOPCON NET-G3A	762-11398	TPSCR.G5 TPSH
2FYS	TOPCON NET-G3A	762-10080	TPSCR.G5 TPSH
2KSY	TOPCON NET-G3	383-0281	TPSCR.G3 TPSH
2MRE	TOPCON NET-G3	383-2171	TPSCR.G3 TPSH
2PEN	TOPCON NET-G3A	762-10059	TPSCR.G5 TPSH
2SIL	TOPCON NET-G3A	762-10899	TPSCR.G5 TPSH
4ACA	TOPCON NET-G3A	383-2088	TPSCR.G3 TPSH
4AUG	TOPCON NET-G3A	383-2234	TPSCR.G3 TPSH
4BYO	TOPCON NET-G3A	762-10022	TPSCR.G5 TPSH
4CB2	TOPCON NET-G3	762-11179	TPSCR.G5 TPSH
4CHI	TOPCON NET-G3A	762-10057	TPSCR.G5 TPSH
4GWI	TOPCON NET-G3A	762-11137	TPSCR.G5 TPSH
4IP2	TOPCON NET-G3	762-11114	TPSCR.G5 TPSH
4KRG	TOPCON NET-G3A	762-11561	TPSCR.G5 TPSH

Station	GPS receiver type	GPS antenna serial number	IGS antenna type and dome type
4MKL	TOPCON NET-G3A	383-2254	TPSCR.G3 TPSH
4MKY	TOPCON NET-G3A	383-2260	TPSCR.G3 TPSH
4RMA	TOPCON NET-G3	383-2255	TPSCR.G3 TPSH
5KAD	TPS NET-G3A	383-2180	TPSCR.G3 TPSH
5LON	TPS NET-G3	383-2185	TPSCR.G3 TPSH
5REG	TPS NET-G3	383-2184	TPSCR.G3 TPSH
5STR	TPS NET-G3A	762-10058	TPSCR.G5 TPSH
5YAN	TPS NET-G3A	762-10060	TPSCR.G5 TPSH
6HSP	TRIMBLE NETR5	144092524	TRM57971.00 NONE
7KNG	TPS NET-G3A	762-11121	TPSCR.G5 TPSH
7SIS	TPS NET-G3A	383-2176	TPSCR.G3 TPSH
7ULV	TPS NET-G3A	762-11045	TPSCR.G3 TPSH
8BAL	TPS NET-G3	762-10922	TPSCR.G5 TPSH
8BUN	TPS NET-G3A	762-11594	TPSCR.G5 TPSH
8MAN	TPS E_GGD	374-0255	TPSCR.G5 TPSH

Table 7: GPS receiver and antenna types for the new stations and stations with meta data changes submitted by Geodesy Section, Geoscience Australia.

Station	GPS receiver type	GPS antenna serial number	IGS antenna type and dome type
BMAN	TRIMBLE NETR9	5209354416	TRM59800.00 NONE
GASC	LEICA GRX1200+GNSS	10170017	LEIAR25.R3 LEIT
KGIS	TRIMBLE NETR9	5220354493	TRM59800.00 SCIS
MCHL	TRIMBLE NETR9	5220354470	TRM59800.00 NONE
MRO1	TRIMBLE NETR9	5220354494	TRM59800.00 NONE
NTJN	LEICA GRX1200+GNSS	00637	JAVRINGANT_DM NONE
PTHL	LEICA GRX1200+GNSS	10120013	LEIAR25.R3 LEIT
SYM1	TRIMBLE NETR9	4938353444	TRM59800.00 NONE
THEV	LEICA GRX1200+GNSS	09370009	LEIAR25.R3 LEIT
YULA	TRIMBLE NETR9	09120017	LEIAR25.R3 NONE

Table 8: GPS receiver and antenna types for the new stations submitted by Department of Environment and Primary Industries, Victoria.

Station	GPS receiver type	GPS antenna serial number	IGS antenna type and dome type
ANGS	TRIMBLE NETR5	11909802	TRM41249.00 NONE
DORA	TRIMBLE NETR9	5138354301	TRM29659.00 NONE
KEPK	TRIMBLE NETR9	1812118265	TRM57971.00 NONE
PACH	TRIMBLE NETR5	1440932041	TRM57971.00 NONE

Table 9: GPS receiver and antenna types for the new stations and stations with meta data changes submitted by Trimble Navigation Australia Pty Ltd.

Station	GPS receiver type	GPS antenna serial number	IGS antenna type and dome type
ADDE	TRIMBLE NETR9	5000112970	TRM57971.00 NONE
CLAY	TRIMBLE NETR9	1441040412	TRM57971.00 NONE
HOBA	TRIMBLE NETR9	30520192	TRM55971.00 NONE
STRL	TRIMBLE NETR9	5311118658	TRM57971.00 NONE
STHE	TRIMBLE NETR9	1441127384	TRM57971.00 NONE
TSRV	TRIMBLE NETR9	5000114866	TRM57971.00 NONE

Table 10: GPS receiver and antenna types for the new stations submitted by Western Australian Land Information Authority.

Station	GPS receiver type	GPS antenna serial number	IGS antenna type and dome type
PER9	TRIMBLE NETR9	30872171	TRM57971.00 NONE
SALT	TRIMBLE NETR5	1440929229	TRM57971.00 NONE

Table 11: GPS receiver and antenna types for the AFN/ARGN/IGS sites.

Station	GPS receiver type	GPS antenna serial number	IGS antenna type and dome type
ALIC	LEICA GRX1200GGPRO	09370001	LEIAR25.R3 NONE
CEDU	TRIMBLE NETR8	194	AOAD/M_T AUST
DARW	GRX1200GGPRO	CR13354	ASH700936D_M NONE
HOB2	LEICA GRX1200GGPRO	203	AOAD/M_T NONE
KARR	TRIMBLE NETR9	5038353985	TRM59800.00 NONE
MOBS	LEICA GRX1200GGPRO	CR20020709	ASH701945C_M NONE
PERT	TRIMBLE NETR9	5220354498	TRM59800.00 NONE
STR1	LEICA GRX1200GGPRO	CR620023911	ASH701945C_M NONE
SYDN	JPS E_GGD	CR519994908	ASH701945C_M NONE
TIDB	ASHTECH UZ-12	205	AOAD/M_T JPLA
TOW2	LEICA GRX1200GGPRO	09310016	LEIAR25.R3 NONE
YARR	LEICA GRX1200PRO	103314	LEIAT504 NONE

Table 12: GPS antenna heights to ARP used in GPS processing for the minimally constrained AFN/ARGN/IGS stations.

Station	Domes number	Antenna height to ARP (m)	Station	Domes number	Antenna height to ARP (m)
ALIC	50137M001	0.0015	PERT	50133M001	0.0595
CEDU	50138M001	0.0060	STR1	50119M002	0.0040
DARW	50134M001	0.0025	SYDN	50124M003	0.0300
HOB2	50116M004	0.0000	TIDB	50103M108	0.0614
KARR	50139M001	0.0005	TOW2	50140M001	0.0033
MOBS	50182M001	0.0000	YARR	50107M006	0.0045

Table 13: GPS antenna heights to ARP used in GPS processing for the new station submitted by RPS Australia East Pty Ltd.

Station	Domes number	Antenna height to ARP (m)
IPSR	-	0.0000

Table 14: GPS antenna heights to ARP used in GPS processing for the new stations and stations with meta data changes submitted by Department of Natural Resources and Mines, Queensland.

Station	Domes number	Antenna height to ARP (m)	Station	Domes number	Antenna height to ARP (m)
ARMC	59902M001	0.0000	MTIS	59908M001	0.0000
EDSV	59904M001	0.0000	NEBO	59903M001	0.0000
ERMG	59897M001	0.0000	NMTN	59909M001	0.0000
GGTN	59920M001	0.0050	TMBO	59901M001	0.0000
KILK	59918M001	0.0026			

Table 15: GPS antenna heights to ARP used in GPS processing for the new stations and stations with meta data changes submitted by Land and Property Information, NSW.

Station	Domes number	Antenna height to ARP (m)	Station	Domes number	Antenna height to ARP (m)
BANK	AUM000314	0.0000	PRCE	AUM000318	0.0000
BATH	AUM000102	0.0000	QUAM	AUM000412	0.0000
BING	59942M001	0.0000	TLPA	AUM000395	0.0000
BRWN	AUM000414	0.0000	WLWN	AUM000317	0.0000
CNDA	AUM000411	0.0000	WTCF	AUM000413	0.0000
NYMA	AUM000397	0.0000			

Table 16: GPS antenna heights to ARP used in GPS processing for the new stations and stations with meta data changes submitted by C.R. Kennedy Survey Solutions.

Station	Domes number	Antenna height to ARP (m)	Station	Domes number	Antenna height to ARP (m)
1770	-	0.0270	MAND	-	0.0000
BDMR	-	0.0350	MCKN	-	0.0000
BER2	-	0.0000	MIRI	-	0.0310
BIND	-	0.0350	MNDU	-	0.0000
BODD	-	0.0700	MNTO	-	0.0310
BSOA	-	0.0140	MOLY	-	0.0350
CALO	-	0.0000	MRT2	-	0.0000
CANN	-	0.0000	MRT3	-	0.0000
CBTN	-	0.0000	NANT	-	0.0000
CDWL	-	0.0350	NHAV	-	0.0000
COOR	-	0.0350	PAIN	-	0.0000
CRKP	-	0.0000	PKNH	-	0.0000
CRNS	-	0.0000	RLST	-	0.0000
CROY	-	0.0700	ROCK	-	0.0000

Station	Domes number	Antenna height to ARP (m)	Station	Domes number	Antenna height to ARP (m)
DWSN	-	0.0000	ROMA	-	0.0000
GDNV	-	0.0000	ROSE	-	0.0310
GRST	-	0.0000	RSWT	-	0.0000
HBG1	-	0.0000	STLW	-	0.0350
INJN	-	0.0000	TCC1	-	0.0000
INSF	-	0.0000	TORQ	-	0.0000
KNWR	-	0.0350	TRUG	-	0.0350
KTHA	-	0.0050	WNBL	-	0.0000
LNGR	-	0.0000	WOLL	-	0.0570
LONG	-	0.0000	WURD	-	0.0000
MAMR	-	0.0350	YRBE	-	0.0850

Table 17: GPS antenna heights to ARP used in GPS processing for the new stations and stations with meta data changes submitted by Position Partners Pty Ltd.

Station	Domes number	Antenna height to ARP (m)	Station	Domes number	Antenna height to ARP (m)
2CBK	-	0.0000	4KRG	-	0.0000
2CCK	-	0.0000	4MKL	-	0.0000
2CHL	-	0.0000	4MKY	-	0.0000
2COW	-	0.0000	4RMA	-	0.0000
2ERS	-	0.0000	5KAD	-	0.0000
2FYS	-	0.0000	5LON	-	0.0000
2KSY	-	0.0000	5REG	-	0.0000
2MRE	-	0.0000	5STR	-	0.0000
2PEN	-	0.0000	5YAN	-	0.0000
2SIL	-	0.0000	6HSP	-	0.0000
4ACA	-	0.0000	7KNG	-	0.0000
4AUG	-	0.0000	7SIS	-	0.0000
4BYO	-	0.0000	7ULV	-	0.0000
4CB2	-	0.0000	8BAL	-	0.0000
4CHI	-	0.0000	8BUN	-	0.0000
4GWI	-	0.0000	8MAN	-	0.0000
4IP2	-	0.0000			

Table 18: GPS antenna heights to ARP used in GPS processing for the new stations and stations with meta data changes submitted by Geodesy Section, Geoscience Australia.

Station	Domes number	Antenna height to ARP (m)	Station	Domes number	Antenna height to ARP (m)
BMAN	59906M001	0.0000	NTJN	59927M001	0.0020
GASC	59911M001	0.0000	PTHL	59912M001	0.0000
KGIS	59910M001	0.0020	SYM1	59899M001	0.0500
MCHL	59905M001	0.0000	THEV	59940M001	0.0000

Station	Domes number	Antenna height to ARP (m)	Station	Domes number	Antenna height to ARP (m)
MRO1	59913M001	0.0000	YULA	59926M001	0.0025

Table 19: GPS antenna heights to ARP used in GPS processing for the new stations submitted by Department of Environment and Primary Industries, Victoria.

Station	Domes number	Antenna height to ARP (m)	Station	Domes number	Antenna height to ARP (m)
ANGS	AUM000419	0.0000	KEPK	AUM000232	0.0000
DORA	AUM000420	0. 0000	PACH	AUM000315	0. 0000

Table 20: GPS antenna heights to ARP used in GPS processing for the new stations and stations with meta data changes submitted by Trimble Navigation Australia Pty Ltd.

Station	Domes number	Antenna height to ARP (m)	Station	Domes number	Antenna height to ARP (m)
ADDE	-	0.0000	STRL	-	0.0000
CLAY	-	0.0000	STHE	-	0.0000
HOBA	-	0.0000	TSRV	-	0.0000

Table 21: GPS antenna heights to ARP used in GPS processing for the new stations submitted by Western Australian Land Information Authority.

Station	Domes number	Antenna height to ARP (m)	Station	Domes number	Antenna height to ARP (m)
PER9	-	0.0000	SALT	-	0.0000

Method

Analysis was undertaken following the procedures detailed in Geoscience Australia's GPS Analysis Manual for the Verification of Position Issue 1.20.

In summary, daily solutions of the campaign stations and AFN/ARGN/IGS/other site data were processed using Bernese GPS Processing Software version 5.0. The Bernese GPS Software conforms to the IERS2003 conventions. IGS final GPS satellite ephemerides and earth orientation parameters were used in the computations. The double difference carrier phase observables at 30-second epoch intervals were used for GPS data processing. Other measurement modelling and parameter estimation included:

- Receiver clock corrections.
- Absolute antenna phase centre variation corrections.
- Solid earth tide displacements.
- Ocean tide loading displacements.
- Elevation cutoff of 10° for all observations.
- QIF integer ambiguity resolution strategy.
- Elevation dependent observation weighting.
- Troposphere zenith delays estimated at 1-hour intervals for all stations.

- Minimum constraint condition for daily network solution in terms of the ITRF2008 using subset of the IGS08 reference stations.

This solution was transformed to GDA94 using the transformation approach detailed in: ITRF to GDA94 coordinate transformation, John Dawson and Alex Woods, *Journal of Applied Geodesy* 4 (2010), no. 4, pp. 189-199, available online at http://www.reference-global.com/loi/jag.

Results

Tables 22 - 30 list the Root Mean Square (RMS) of the daily station coordinate values for the new stations and stations with meta data changes. Tables 31 - 39 list the station coordinates resulting from the combination of the daily ITRF solutions and their subsequent transformation to GDA94 for the new stations and stations with meta data changes.

Table 22: Root Mean Square (RMS) of daily station coordinates for the new station submitted by RPS Australia East Pty Ltd.

Station	North (mm)	East (mm)	Up (mm)
IPSR	1.8	1.5	8.0

Table 23: Root Mean Square (RMS) of daily station coordinates for the new stations and stations with meta data changes submitted by Department of Natural Resources and Mines, Queensland.

Station	North (mm)	East (mm)	Up (mm)	Station	North (mm)	East (mm)	Up (mm)
ARMC	1.0	0.9	2.9	MTIS	0.7	0.4	2.6
EDSV	0.9	0.6	3.5	NEBO	1.5	1.3	2.0
ERMG	0.8	0.7	3.4	NMTN	1.4	0.8	5.2
GGTN	0.5	0.5	2.2	TMBO	0.8	0.7	3.6
KILK	0.8	0.7	3.4				

Table 24: Root Mean Square (RMS) of daily station coordinates for the new stations and stations with meta data changes submitted by Land and Property Information, NSW.

Station	North (mm)	East (mm)	Up (mm)	Station	North (mm)	East (mm)	Up (mm)
BANK	1.0	1.0	3.8	PRCE	1.3	1.7	3.6
BATH	0.8	0.9	2.4	QUAM	0.6	0.2	1.4
BING	0.9	1.4	3.1	TLPA	0.8	0.7	2.7
BRWN	0.9	0.5	2.3	WLWN	1.3	0.7	5.4
CNDA	1.1	0.3	1.4	WTCF	1.0	0.4	3.9
NYMA	1.4	0.8	2.4				

Table 25: Root Mean Square (RMS) of daily station coordinates for the new stations and stations with meta data changes submitted by C.R. Kennedy Survey Solutions.

Station	North (mm)	East (mm)	Up (mm)	Station	North (mm)	East (mm)	Up (mm)
1770	1.1	1.3	1.8	MAND	1.5	1.2	5.2
BDMR	1.2	1.1	4.6	MCKN	1.1	1.6	6.8
BER2	0.6	1.0	3.9	MIRI	0.7	1.4	4.9
BIND	1.3	0.9	3.3	MNDU	1.3	1.4	4.6
BODD	0.8	0.9	8.2	MNTO	2.4	1.6	6.2
BSOA	0.9	0.7	4.9	MOLY	1.2	1.2	3.1
CALO	1.4	0.9	3.6	MRT2	1.0	0.4	3.6

Station	North (mm)	East (mm)	Up (mm)	Station	North (mm)	East (mm)	Up (mm)
CANN	0.8	0.9	3.5	MRT3	0.9	0.8	3.3
CBTN	1.3	1.2	5.3	NANT	0.5	0.4	5.3
CDWL	1.1	0.7	3.8	NHAV	0.9	1.1	5.2
COOR	1.2	1.4	4.5	PAIN	2.0	1.0	3.5
CRKP	1.0	0.8	3.8	PKNH	1.4	0.9	4.2
CRNS	1.2	1.1	5.6	RLST	1.5	1.6	5.4
CROY	1.8	1.6	6.3	ROCK	1.2	1.7	2.2
DWSN	1.1	1.1	5.4	ROMA	1.2	0.7	3.9
GDNV	0.9	1.3	5.3	ROSE	1.0	1.2	6.4
GRST	1.3	1.4	5.0	RSWT	0.8	0.9	3.3
HBG1	1.5	1.1	7.9	STLW	1.3	0.7	5.3
INJN	1.7	1.6	7.8	TCC1	0.9	1.4	6.4
INSF	1.1	0.8	4.1	TORQ	1.9	0.7	3.6
KNWR	1.2	1.1	7.9	TRUG	1.3	1.5	8.4
KTHA	1.5	1.0	4.5	WNBL	1.8	0.6	4.4
LNGR	1.4	0.8	5.6	WOLL	1.2	1.4	6.8
LONG	1.3	0.6	6.0	WURD	2.0	0.9	4.2
MAMR	1.1	1.8	7.0	YRBE	0.7	0.8	4.8

Table 26: Root Mean Square (RMS) of daily station coordinates for the new stations and stations with meta data changes submitted by Position Partners Pty Ltd.

Station	North (mm)	East (mm)	Up (mm)	Station	North (mm)	East (mm)	Up (mm)
2CBK	0.5	1.2	5.2	4KRG	1.1	0.8	2.7
2CCK	0.6	0.8	2.2	4MKL	0.9	0.9	3.9
2CHL	0.7	0.8	2.9	4MKY	0.8	1.3	8.0
2COW	1.4	1.2	2.5	4RMA	1.0	1.2	3.0
2ERS	1.1	0.6	3.5	5KAD	1.1	1.2	3.0
2FYS	0.8	1.6	3.7	5LON	1.4	1.0	3.0
2KSY	0.6	1.0	3.8	5REG	1.1	1.2	3.9
2MRE	1.3	0.4	2.6	5STR	1.0	2.1	3.2
2PEN	1.0	1.1	4.3	5YAN	1.3	1.7	4.1
2SIL	0.7	1.0	3.2	6HSP	1.7	2.8	5.7
4ACA	1.0	0.6	4.0	7KNG	2.8	2.1	5.3
4AUG	1.0	0.6	5.1	7SIS	1.3	0.8	2.6
4BYO	1.0	0.9	5.1	7ULV	1.0	1.0	2.6
4CB2	1.0	0.6	3.7	8BAL	0.8	1.0	4.3
4CHI	1.1	0.8	2.5	8BUN	0.9	1.0	3.9
4GWI	0.9	0.5	2.9	8MAN	1.1	1.4	3.5
4IP2	1.1	1.4	3.9				

Table 27: Root Mean Square (RMS) of daily station coordinates for the new stations and stations with meta data changes submitted by Geodesy Section, Geoscience Australia.

Station	North (mm)	East (mm)	Up (mm)	Station	North (mm)	East (mm)	Up (mm)
BMAN	0.9	0.9	6.1	NTJN	0.8	0.6	1.8
GASC	0.6	0.7	2.1	PTHL	0.5	0.3	2.1
KGIS	0.9	0.9	3.3	SYM1	0.6	1.2	4.0
MCHL	1.3	0.7	4.3	THEV	0.4	0.6	2.6
MRO1	0.6	0.5	1.7	YULA	0.4	0.5	1.9

Table 28: Root Mean Square (RMS) of daily station coordinates for the new stations submitted by Department of Environment and Primary Industries, Victoria.

Station	North (mm)	East (mm)	Up (mm)	Station	North (mm)	East (mm)	Up (mm)
ANGS	1.2	0.6	6.6	KEPK	1.0	0.9	5.3
DORA	1.4	0.9	4.7	PACH	0.6	0.8	3.0

Table 29: Root Mean Square (RMS) of daily station coordinates for the new stations and stations with meta data changes submitted by Trimble Navigation Australia Pty Ltd.

Station	North (mm)	East (mm)	Up (mm)	Station	North (mm)	East (mm)	Up (mm)
ADDE	0.6	1.2	3.6	STRL	0.4	1.0	3.6
CLAY	1.2	1.0	5.7	STHE	1.9	1.4	4.2
HOBA	2.2	2.6	6.5	TSRV	1.7	1.5	6.7

Table 30: Root Mean Square (RMS) of daily station coordinates for the new stations submitted by Western Australian Land Information Authority.

Station	North (mm)	East (mm)	Up (mm)	Station	North (mm)	East (mm)	Up (mm)
PER9	0.4	1.2	5.1	SALT	0.9	0.7	2.3

Table 31: Computed Geocentric Datum of Australia (GDA94) geodetic coordinates and their uncertainty for the new station submitted by RPS Australia East Pty Ltd. The uncertainties are calculated in accordance with the principles of the ISO Guide to the Expression of Uncertainty in Measurement (1995), with an interval estimated to have a confidence level of 95% at the time of verification. The combined standard uncertainty was converted to an expanded uncertainty using a coverage factor, k, of 2.

Station	Longitude (DMS east) Uncertainty (m)			Latitude (DMS south) Uncertainty (m)			Ellipsoidal height (m) Uncertainty (m)
IPSR	152	45	19.50958	27	36	52.88116	75.4994
			±0.008			±0.008	±0.018

Table 32: Computed Geocentric Datum of Australia (GDA94) geodetic coordinates and their uncertainty for the new stations and stations with meta data changes submitted by Department of Natural Resources and Mines, Queensland. The uncertainties are calculated in accordance with the principles of the ISO Guide to the Expression of Uncertainty in Measurement (1995), with an interval estimated to have a confidence level of 95% at the time of verification. The combined standard uncertainty was converted to an expanded uncertainty using a coverage factor, k, of 2.

Station	Longitude (DMS east) Uncertainty (m)			Latitude (DMS south) Uncertainty (m)			Ellipsoidal height (m) Uncertainty (m)
ARMC	145	14	43.61482	22	57	24.56743	274.3356
			±0.007			±0.008	±0.017
EDSV	151	7	11.20916	25	22	32.92217	288.4947
			±0.008			±0.008	±0.019
ERMG	143	15	44.27091	26	42	43.97984	200.2212
			±0.008			±0.008	±0.018
GGTN	143	32	26.26011	18	18	21.4981	367.2191
			±0.008			±0.008	±0.018
KILK	152	15	7.42243	26	5	3.22008	250.9054
			±0.008			±0.008	±0.018
MTIS	139	29	11.12755	20	41	25.48764	398.0376
			±0.008			±0.008	±0.018
NEBO	148	41	54.76293	21	38	25.04962	341.564
			±0.008			±0.008	±0.020
NMTN	141	4	8.98508	17	40	18.08598	60.6739
			±0.008			±0.008	±0.019
TMBO	146	17	2.72029	24	46	18.16422	589.5511
			±0.008			±0.008	±0.019

Table 33: Computed Geocentric Datum of Australia (GDA94) geodetic coordinates and their uncertainty for the new stations and stations with meta data changes submitted by Land and Property Information, NSW. The uncertainties are calculated in accordance with the principles of the ISO Guide to the Expression of Uncertainty in Measurement (1995), with an interval estimated to have a confidence level of 95% at the time of verification. The combined standard uncertainty was converted to an expanded uncertainty using a coverage factor, k, of 2.

Station	Longitude (DMS east) Uncertainty (m)			Latitude (DMS south) Uncertainty (m)			Ellipsoidal height (m) Uncertainty (m)
BANK	151	2	10.76954	33	54	54.27909	101.4539
			±0.008			±0.008	±0.019
BATH	149	34	1.95865	33	25	46.90218	756.6232
			±0.008			±0.008	±0.019
BING	151	39	8.37338	32	24	42.41122	486.8712
			±0.008			±0.008	±0.020
BRWN	146	51	38.92873	29	58	6.28388	149.5639
			±0.008			±0.008	±0.020
CNDA	147	41	17.27277	30	27	55.16285	161.2575
			±0.008			±0.008	±0.019
NYMA	146	18	56.24261	32	3	58.17377	332.3897
			±0.008			±0.008	±0.019

Station	Longitude (DMS east) Uncertainty (m)			Latitude (DMS south) Uncertainty (m)			Ellipsoidal height (m) Uncertainty (m)
PRCE	149	5	20.37765	35	21	48.8904	639.7634
			±0.008			±0.008	±0.019
QUAM	147	52	12.01378	30	55	58.80854	185.4846
			±0.008			±0.008	±0.019
TLPA	144	24	49.6282	30	52	1.10141	183.9839
			±0.008			±0.008	±0.019
WLWN	152	37	31.64249	30	55	50.33291	89.7002
			±0.008			±0.008	±0.019
WTCF	143	5	34.8294	30	51	11.86833	168.7524
			±0.008			±0.008	±0.019

Table 34: Computed Geocentric Datum of Australia (GDA94) geodetic coordinates and their uncertainty for the new stations and stations with meta data changes submitted by C.R. Kennedy Survey Solutions. The uncertainties are calculated in accordance with the principles of the ISO Guide to the Expression of Uncertainty in Measurement (1995), with an interval estimated to have a confidence level of 95% at the time of verification. The combined standard uncertainty was converted to an expanded uncertainty using a coverage factor, k, of 2.

Station	Longitude (DMS east) Uncertainty (m)			Latitude (DMS south) Uncertainty (m)			Ellipsoidal height (m) Uncertainty (m)
1770	151	53	13.18798	24	9	32.48957	126.4892
			±0.008			±0.008	±0.021
BDMR	149	31	19.21513	25	30	37.69191	295.5925
			±0.008			±0.008	±0.020
BER2	140	36	7.27962	34	17	4.77246	37.6942
			±0.008			±0.008	±0.020
BIND	149	2	50.90804	26	39	54.36187	366.755
			±0.008			±0.008	±0.020
BODD	116	21	59.92328	32	44	24.98316	347.5672
			±0.008			±0.008	±0.022
BSOA	147	58	45.75196	21	49	22.95654	304.7111
			±0.008			±0.008	±0.020
CALO	151	12	39.16538	23	59	59.14669	128.5597
			±0.008			±0.008	±0.021
CANN	140	55	1.84802	21	51	45.53953	301.8358
			±0.008			±0.008	±0.022
CBTN	150	49	12.50198	34	3	47.86104	101.2843
			±0.008			±0.008	±0.020
CDWL	146	1	19.67237	18	16	1.7262	72.3792
			±0.008			±0.008	±0.020
COOR	149	30	10.1651	25	0	36.78858	401.6649
			±0.008			±0.008	±0.021
CRKP	115	50	28.28993	31	56	33.0337	0.9502
			±0.008			±0.008	±0.021

Station	Longitude (DMS east) Uncertainty (m)			Latitude (DMS south) Uncertainty (m)			Ellipsoidal height (m) Uncertainty (m)
CRNS	145	45	29.92887	16	56	8.61665	72.0191
			±0.008			±0.008	±0.020
CROY	145	17	59.72714	37	48	51.28515	122.527
			±0.008			±0.008	±0.020
DWSN	150	1	38.79703	24	33	34.49278	181.0256
			±0.008			±0.008	±0.020
GDNV	145	46	51.21909	17	5	48.46917	89.7615
			±0.008			±0.008	±0.020
GRST	149	18	16.98228	21	21	26.66574	108.8028
			±0.008			±0.008	±0.021
HBG1	150	59	8.05507	34	11	16.51807	258.8448
			±0.008			±0.008	±0.020
INJN	148	33	55.95995	25	50	35.54347	437.1178
			±0.008			±0.008	±0.021
INSF	146	1	44.97464	17	31	37.34373	72.3149
			±0.008			±0.008	±0.020
KNWR	150	8	25.79056	22	47	56.83733	74.014
			±0.008			±0.008	±0.020
KTHA	116	50	38.88834	20	44	4.44602	10.2288
			±0.008			±0.008	±0.019
LNGR	148	36	10.9881	32	14	48.10777	297.3032
			±0.008			±0.008	±0.020
LONG	144	16	27.1451	23	26	16.62297	235.2738
			±0.008			±0.008	±0.021
MAMR	150	42	18.43271	23	43	35.14117	86.6254
			±0.008			±0.008	±0.021
MAND	151	27	43.76942	33	7	6.06755	43.9606
			±0.008			±0.008	±0.020
MCKN	138	39	5.21413	35	31	18.96174	34.5699
			±0.008			±0.008	±0.020
MIRI	151	33	35.93729	24	19	40.1181	113.3512
			±0.008			±0.008	±0.021
MNDU	151	53	57.39737	26	47	43.55439	495.3009
			±0.008			±0.008	±0.027
MNTO	151	7	34.21539	24	52	13.60384	290.317
			±0.008			±0.008	±0.020
MOLY	145	19	59.31266	16	40	36.28374	476.0317
			±0.008			±0.008	±0.022
MRT2	147	28	43.6089	19	27	35.3643	65.4021
			±0.008			±0.008	±0.020
MRT3	146	31	4.31939	19	19	52.71151	131.8081

Station	Longitude (DMS east) Uncertainty (m)			Latitude (DMS south) Uncertainty (m)			Ellipsoidal height (m) Uncertainty (m)
			±0.008			±0.008	±0.020
NANT	138	15	45.98127	34	1	1.07332	170.5105
			±0.008			±0.008	±0.020
NHAV	138	29	22.18491	34	47	37.7864	11.0422
			±0.008			±0.008	±0.020
PAIN	144	4	4.03635	38	26	31.59646	40.0864
			±0.008			±0.008	±0.019
PKNH	145	29	8.04478	38	4	39.19219	41.8023
			±0.008			±0.008	±0.019
RLST	148	23	48.74009	24	24	23.96625	309.1517
			±0.008			±0.008	±0.020
ROCK	150	30	50.92657	23	22	40.70586	67.597
			±0.008			±0.008	±0.021
ROMA	148	47	16.33815	26	34	10.41018	344.6797
			±0.008			±0.008	±0.022
ROSE	151	54	52.72763	24	37	51.74764	100.4171
			±0.008			±0.008	±0.021
RSWT	138	45	3.35976	34	32	10.58072	126.0288
			±0.008			±0.008	±0.020
STLW	149	35	15.77568	22	28	59.54646	83.589
			±0.008			±0.008	±0.021
TCC1	146	46	18.82224	19	16	14.73981	73.9221
			±0.008			±0.008	±0.020
TORQ	144	18	35.62355	38	19	19.00624	58.0149
			±0.008			±0.008	±0.019
TRUG	149	12	37.15996	24	32	32.23534	336.5846
			±0.008			±0.008	±0.020
WNBL	142	28	42.63722	38	22	57.80299	26.69
			±0.008			±0.008	±0.019
WOLL	150	53	27.46469	34	25	39.39425	60.2622
			±0.008			±0.008	±0.020
WURD	144	3	5.62476	38	16	56.20382	137.0006
			±0.008			±0.008	±0.019
YRBE	149	0	59.98701	23	16	12.07823	206.3979
			±0.008			±0.008	±0.020

Table 35: Computed Geocentric Datum of Australia (GDA94) geodetic coordinates and their uncertainty for the new stations and stations with meta data changes submitted by Position Partners Pty Ltd. The uncertainties are calculated in accordance with the principles of the ISO Guide to the Expression of Uncertainty in Measurement (1995), with an interval estimated to have a confidence level of 95% at the time of verification. The combined standard uncertainty was converted to an expanded uncertainty using a coverage factor, k, of 2.

Station	Longitude (DMS east) Uncertainty (m)			Latitude (DMS south) Uncertainty (m)			Ellipsoidal height (m) Uncertainty (m)
2CBK	150	40	59.94148	33	43	36.76734	56.1915
			±0.008			±0.008	±0.018
2CCK	150	12	17.72382	29	2	46.59726	290.1329
			±0.007			±0.007	±0.016
2CHL	145	24	46.91513	34	34	4.36225	129.3448
			±0.007			±0.007	±0.016
2COW	148	40	31.52929	33	50	24.93019	323.67
			±0.008			±0.008	±0.018
2ERS	150	48	13.73736	33	51	4.78001	117.3388
			±0.008			±0.008	±0.018
2FYS	149	10	29.05542	35	19	30.33365	603.299
			±0.008			±0.008	±0.018
2KSY	152	49	48.97124	31	4	12.35272	50.1042
			±0.008			±0.008	±0.018
2MRE	149	51	10.85837	29	27	0.23794	248.3555
			±0.008			±0.008	±0.019
2PEN	150	41	15.84009	33	44	23.95218	61.5409
			±0.008			±0.008	±0.018
2SIL	151	2	54.21622	33	50	21.37383	41.5295
			±0.008			±0.008	±0.018
4ACA	153	2	19.50554	27	35	54.69761	115.292
			±0.008			±0.008	±0.018
4AUG	152	52	55.55214	27	39	36.88605	86.0875
			±0.008			±0.008	±0.019
4BYO	153	4	42.06993	27	22	54.81521	57.0881
			±0.008			±0.008	±0.019
4CB2	152	59	14.541	27	5	4.23768	59.6737
			±0.008			±0.008	±0.019
4CHI	150	37	25.10481	26	44	27.61347	352.1046
			±0.008			±0.008	±0.018
4GWI	150	18	11.24306	28	32	47.57559	258.3736
			±0.008			±0.008	±0.018
4IP2	152	45	35.19384	27	38	6.08067	69.4552
			±0.008			±0.008	±0.019
4KRG	153	4	59.65841	27	13	30.08317	50.5793
			±0.008			±0.008	±0.019
4MKL	147	18	48.19138	19	39	43.75804	251.0344

Station	Longitude (DMS east) Uncertainty (m)			Latitude (DMS south) Uncertainty (m)			Ellipsoidal height (m) Uncertainty (m)
			±0.008			±0.008	±0.019
4MKY	149	9	31.90644	21	7	1.93896	77.6436
			±0.008			±0.008	±0.020
4RMA	148	49	11.43736	26	34	31.42743	345.0739
			±0.008			±0.008	±0.019
5KAD	137	42	29.49688	33	58	17.54884	47.1225
			±0.007			±0.008	±0.018
5LON	138	30	2.94469	35	6	58.73526	95.645
			±0.008			±0.008	±0.018
5REG	138	34	16.64885	34	52	9.13298	12.935
			±0.008			±0.008	±0.019
5STR	138	53	45.04178	35	16	13.16125	82.3829
			±0.008			±0.008	±0.018
5YAN	138	21	2.73977	35	27	25.8862	44.3603
			±0.008			±0.008	±0.019
6HSP	131	4	57.67075	12	30	36.54271	83.4596
			±0.008			±0.008	±0.024
7KNG	147	18	41.87903	42	58	32.46191	21.7375
			±0.008			±0.008	±0.019
7SIS	145	35	3.40965	40	57	42.04584	119.977
			±0.008			±0.008	±0.018
7ULV	146	9	36.47166	41	12	47.5744	197.0114
			±0.007			±0.008	±0.016
8BAL	115	49	18.85954	31	51	42.8175	5.8849
			±0.008			±0.008	±0.018
8BUN	115	39	22.91296	33	21	58.80029	-6.6747
			±0.008			±0.008	±0.019
8MAN	115	43	13.69979	32	31	32.16239	-24.2022
			±0.008			±0.008	±0.019

Table 36: Computed Geocentric Datum of Australia (GDA94) geodetic coordinates and their uncertainty for the new stations and stations with meta data changes submitted by Geodesy Section, Geoscience Australia. The uncertainties are calculated in accordance with the principles of the ISO Guide to the Expression of Uncertainty in Measurement (1995), with an interval estimated to have a confidence level of 95% at the time of verification. The combined standard uncertainty was converted to an expanded uncertainty using a coverage factor, k, of 2.

Station	Longitude (DMS east) Uncertainty (m)			Latitude (DMS south) Uncertainty (m)			Ellipsoidal height (m) Uncertainty (m)
BMAN	138	42	25.25708	31	6	22.79161	616.7308
			±0.007			±0.008	±0.018
GASC	115	20	18.98072	24	37	57.493	182.4685
			±0.008			±0.007	±0.017
KGIS	143	50	49.44924	39	56	30.69002	6.2553

Station	Longitude (DMS east) Uncertainty (m)			Latitude (DMS south) Uncertainty (m)			Ellipsoidal height (m) Uncertainty (m)
			±0.007			±0.008	±0.017
MCHL	148	8	41.83868	26	21	32.09323	534.7062
			±0.007			±0.007	±0.017
MRO1	116	38	14.9412	26	41	47.93325	354.1516
			±0.008			±0.007	±0.017
NTJN	133	58	12.12938	21	27	26.08559	619.4509
			±0.007			±0.008	±0.018
PTHL	118	40	43.86298	20	32	23.12908	41.0967
			±0.007			±0.007	±0.017
SYM1	149	9	39.81036	35	20	33.06655	592.3246
			±0.007			±0.008	±0.018
THEV	133	41	48.5519	32	7	43.0754	7.5637
			±0.008			±0.008	±0.021
YULA	130	56	29.63364	25	13	51.82211	512.319
			±0.007			±0.007	±0.017

Table 37: Computed Geocentric Datum of Australia (GDA94) geodetic coordinates and their uncertainty for the new stations submitted by Department of Environment and Primary Industries, Victoria. The uncertainties are calculated in accordance with the principles of the ISO Guide to the Expression of Uncertainty in Measurement (1995), with an interval estimated to have a confidence level of 95% at the time of verification. The combined standard uncertainty was converted to an expanded uncertainty using a coverage factor, k, of 2.

Station	Longitude (DMS east) Uncertainty (m)			Latitude (DMS south) Uncertainty (m)			Ellipsoidal height (m) Uncertainty (m)
ANGS	144	11	35.44847	38	23	46.55941	19.6447
			±0.008			±0.008	±0.020
DORA	145	03	51.93300	37	40	51.10559	141.2301
			±0.008			±0.008	±0.019
KEPK	144	50	52.31186	37	43	15.86487	89.5647
			±0.008			±0.008	±0.019
PACH	142	11	27.18942	35	22	58.62551	82.1986
			±0.008			±0.008	±0.020

Table 38: Computed Geocentric Datum of Australia (GDA94) geodetic coordinates and their uncertainty for the new stations and stations with meta data changes submitted by Trimble Navigation Australia Pty Ltd. The uncertainties are calculated in accordance with the principles of the ISO Guide to the Expression of Uncertainty in Measurement (1995), with an interval estimated to have a confidence level of 95% at the time of verification. The combined standard uncertainty was converted to an expanded uncertainty using a coverage factor, k, of 2.

Station	Longitude (DMS east) Uncertainty (m)			Latitude (DMS south) Uncertainty (m)			Ellipsoidal height (m) Uncertainty (m)
ADDE	138	34	47.04789	34	56	34.81856	33.9256
			±0.007			±0.008	±0.018
CLAY	145	08	49.73715	37	55	9.04809	78.8852
			±0.007			±0.008	±0.018

Station	Longitude (DMS east) Uncertainty (m)			Latitude (DMS south) Uncertainty (m)			Ellipsoidal height (m) Uncertainty (m)
HOBA	147	19	41.20416	42	53	5.89936	58.4360
			±0.007			±0.008	±0.018
STRL	115	48	29.09253	31	53	20.62192	-2.7355
			±0.008			±0.008	±0.018
STHE	148	14	59.57179	41	19	14.81671	12.1571
			±0.008			±0.008	±0.018
TSRV	145	12	27.84284	41	29	22.46039	354.1963
			±0.008			±0.008	±0.018

Table 39: Computed Geocentric Datum of Australia (GDA94) geodetic coordinates and their uncertainty for the new stations submitted by Western Australian Land Information Authority. The uncertainties are calculated in accordance with the principles of the ISO Guide to the Expression of Uncertainty in Measurement (1995), with an interval estimated to have a confidence level of 95% at the time of verification. The combined standard uncertainty was converted to an expanded uncertainty using a coverage factor, k, of 2.

Station	Longitude (DMS east) Uncertainty (m)			Latitude (DMS south) Uncertainty (m)			Ellipsoidal height (m) Uncertainty (m)
PER9	115	48	31.55329	31	54	36.56436	-16.0913
			±0.008			±0.008	±0.018
SALT	115	52	14.53394	32	01	18.48561	-13.8094
			±0.008			±0.008	±0.018

END OF REPORT