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D.GPS for ground control in the Quindabellup and Wambellup sub-catchments

Buddy Wheaton

buddy.wheaton@dpird.wa.gov.au

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**D.GPS FOR GROUND CONTROL
IN THE QUINDABELLUP AND
WAMBELLUP SUB-CATCHMENTS**

KENT CATCHMENT STUDY AREA



NOVEMBER 1995

**BUDDY WHEATON
AGRICULTURE WESTERN AUSTRALIA**

D.GPS FOR GROUND CONTROL IN THE QUINDABELLUP AND WAMBELLUP SUB-CATCHMENTS

This report summarises work undertaken to provide ground control for digital terrain models (DTMs) of the Quindabellup and Wambellup sub-catchments. The DTMs will be generated using digital photogrammetry; the ground control was obtained using differential Global Positioning System (D.GPS). For a detailed description of D.GPS see Featherstone (1995).

Description of Bench Marks (BMs) and summary sheets of Standard Survey Marks (SSMs) located in the general area, were obtained from the Department of Land Administration (DOLA). A ground survey was carried out to confirm the location and condition of BMs and SSMs in the two sub-catchments. Five SSMs were selected as reference points for the D.GPS survey. A further 8 bench marks and 1 SSM were identified for vertical control. A copy of the Description of Bench Marks and the summary sheets for the SSMs are contained in Appendix 1.

Photo preparation included identifying sites for control observations. These sites were visited in the field and a feature that was clearly identifiable in the air photo and on the ground was selected and used for the GPS observation. Bench Mark elevations were transferred to the centre line of the adjacent road.

The D.GPS survey was carried out using a Trimble 4000 SSE dual frequency receiver as a base station and either a 4000 SSE or 4000 ST (single frequency) as a roving receiver. Both receivers were used in 'static' mode with observation times not less than 50 minutes.

Post processing of the raw GPS data was carried out using Trimble's GPS Survey software.

Baselines from control stations to observed points were calculated (Figure 1).

A minimally constrained network adjustment was computed on all points (including control stations) holding MBR51 as a fixed station. The GPS derived positions of the remaining control stations were compared to the published coordinates and were found to be within acceptable limits. A readjustment of the observed points was carried out holding all control stations as fixed. This calculation yielded adjusted Geographic Coordinates (WGS84) and an ellipsoidal height for the observed points (Appendix 2).

Coordinate Transformation

The derived WGS84 coordinates (lats and longs) were transformed to AGD84 using the GeoDATic software package (Barrington and Featherstone, 1995) and output in AMG coordinates (Appendix 3).

Vertical Transformation

Local elevations (AHD) were determined with consideration of the geoid-WGS84-ellipsoid separation.

Network Map: Kent2

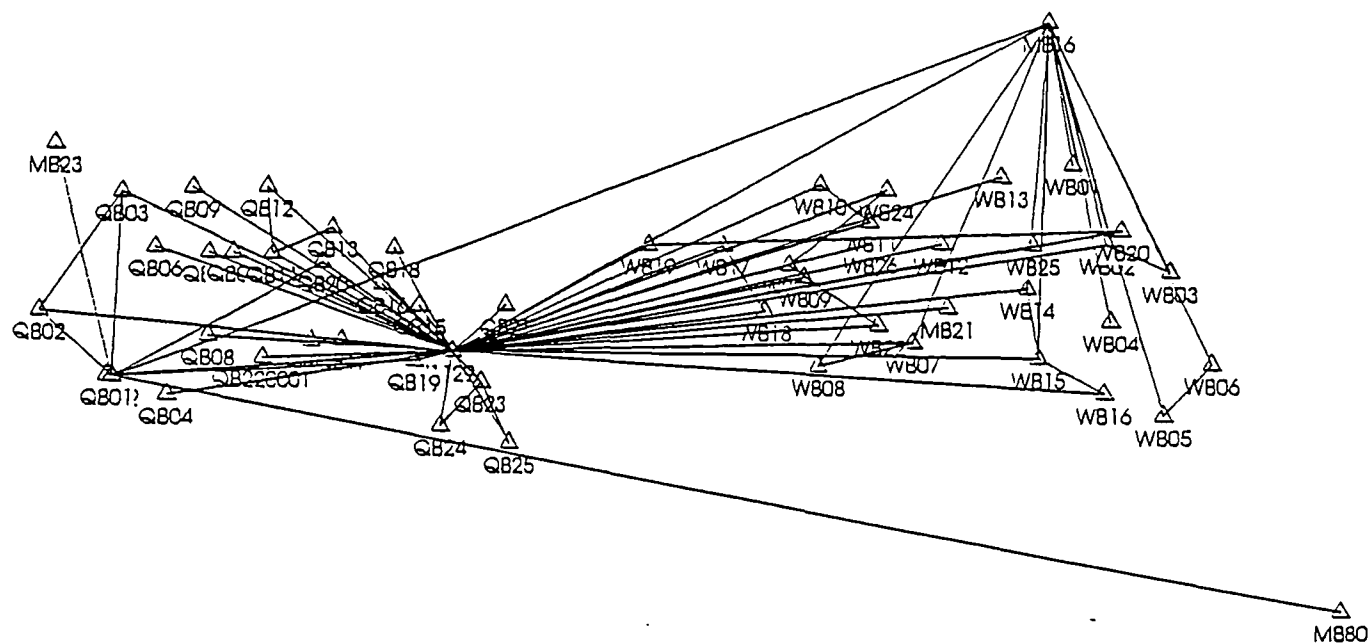


FIGURE 1: Network Map. GPS observed baselines from control stations to ground control points

The geoid-ellipsoid separation (N value) for the ground control points was computed using Winter/AUSGEOID93 (Steed and Holtznag 1994). These N values were subtracted (algebraic) from the WGS84 ellipsoidal heights to give AHD elevations on the observed points using:

$$H = h - N$$

where H = AHD elevation
h = WGS84 ellipsoidal height
N = geoid-ellipsoid separation.

AHD for ground control points and road centre-line elevations are shown in Appendix 4.

The following files are stored on disk and held at Agriculture Western Australia at South Perth. Files were backed up using the BACKUP command within GPS Survey. A Trimble software key is needed to access these files.

.....	•DAT (rawgps)
.....	•SSF (processed baselines)
Kent 2	•ADJ (adjusted coordinates; Lat, Long, Ellip. Height)
Kent 2	•AMG (AMG coordinates)
Kent 2	•INT (geoid-ellipsoidal separation)

References

- Barrington, T.R. and Featherstone, W.E. (1995). The development of a Windows-based coordination transformation package. *Surveying Australia* 17. No.1.
- Featherstone, W.E. (1995). The global positioning system (GPS) and its use in geophysical exploration. *Exploration Geophysics* 26, 1-18.
- Steed, J. And Holtznagel, S. (1994). AHD heights from GPS using AUSGE01093. *The Australian Surveyor*, 39, No.1. 21-27.

APPENDIX 1

Description Sheets of Bench Marks

Summary Sheets for Standard Survey Marks

DATE: 25 AUG 95
TIME: 09:32:41
USER: LIBGMOO

DEPARTMENT OF LAND ADMINISTRATION
MAPPING AND SURVEY DIVISION
GEODETIC SURVEY SERVICES

PAGE: 1

TYPE OF MARK: Bench Mark

PRIMARY NAME: HO 31

DATABASE NUMBER: 128477

MARK STAMPED: HO31

ALTERNATE NAMES:

CLASS:

HORIZONTAL DETAILS

AGD84 LATITUDE: 34 27 9.45920
LONGITUDE: 117 28 20.83260
AMG84 EASTING: 543397.620
NORTHING: 6187541.269
ZONE: 50
CONVERGENCE: 0 16 2.22
POINT SCALE: 0.99962321

WGS84 LATITUDE: 34 27 5.10428
LONGITUDE: 117 28 26.28401
UTM EASTING: 543537.186
NORTHING: 6187687.990
ZONE: 50
CONVERGENCE: 0 16 5.27
POINT SCALE: 0.99962336

EXPECTED ACCURACY: 500m ORDER: fifth

METHOD OF SURVEY: digitized

ADJUSTMENT NAME: DATE COORDINATED: 09/11/1987

ERROR ELLIPSE, MAJOR AXIS: MINOR AXIS: ORIENTATION: (DEGS)

NOTE: AGD84, AUSTRALIAN GEODETIC DATUM 1984 USING THE AUSTRALIAN NATIONAL SPHEROID, A = 6378160.000, 1/F = 298.25, WITH THE JOHNSTON PILLAR AS THE ORIGIN. COORDINATES ARE BASED ON THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION IN METRES.

NOTE: WGS84 COORDINATES DERIVED USING AGD84 to WGS84 (7 Parameter) TRANSFORMATION. PARAMETERS DX = -116.00000, DY = -50.47000, DZ = 141.69000, RX = -0.23000, RY = -0.39000, RZ = -0.34400, DS = 0.09830 PPM

NO HISTORIC COORDINATE SYSTEMS

VERTICAL DETAILS

AHD HEIGHT(M): 251.974 AGD84 SPHEROIDAL HEIGHT: 272.53 SEPARATION(M): 20.56

WGS84 SPHEROIDAL HEIGHT: 222.98 SEPARATION(M): -29.00

EXPECTED ACCURACY: 12 rootK(mm) ORDER: third

METHOD OF SURVEY: spirit levelling

LINADJ SECTIONS:

ROUND LEVEL TO MARK:

AUTHORITY WHO ESTABLISHED HEIGHT: Dept of Land Admin.

HATCH COVER TO MARK:

SURVEYOR WHO ESTABLISHED HEIGHT: J VINER/E BINGHAM

HATCH COVER TYPE: unknown

NOTE: AHD, AUSTRALIAN HEIGHT DATUM IN METRES

OTE: GEOID-SPHEROID SEPARATIONS DERIVED FROM THE AUSGEOD93 DIGITAL GEOID MODEL

REFERENCE MARKS

NAME	DB NUMBER	TYPE	SETIN	STATUS	DATE	AZIMUTH	TYPE	DISTANCE	TYPE	MARK-RM	STATUS	GL-RM
M1	3752339	SP	CONC	EST	01/06/1982			14.900	H	-0.195	FINAL	
RM2	3752340	SP	CONC	EST	01/06/1982			14.800	H	-0.034	FINAL	

AGD84				WGS84			
NAME	DB NUMBER	LATITUDE	LONGITUDE	EASTING	NORTHING	ZN	
PM1	3752339	NO COORDINATES COMPUTED		INSUFFICIENT PRECISE DATA AC			
M2	3752340	NO COORDINATES COMPUTED		INSUFFICIENT PRECISE DATA AC			

NO HEIGHT DIFFERENCES

NO SPECIAL NOTES

NO ADJACENT STATIONS

***** END OF STATION SUMMARY *****

TYPE OF MARK: Bench Mark

MARY NAME: HO 29

DATABASE NUMBER: 128475

MARK STAMPED: HO29

ALTERNATE NAMES:

CLASS:

HORIZONTAL DETAILS

AGD84 LATITUDE: 34 28 17.18620
LONGITUDE: 117 28 10.99780
AMG84 EASTING: 543137.000
NORTHING: 6185456.292
ZONE: 50
CONVERGENCE: 0 15 57.11
POINT SCALE: 0.99962294

WGS84 LATITUDE: 34 28 12.83219
LONGITUDE: 117 28 16.45046
UTM EASTING: 543276.565
NORTHING: 6185602.996
ZONE: 50
CONVERGENCE: 0 16 0.17
POINT SCALE: 0.99962308

SELECTED ACCURACY: 500m ORDER: fifth

METHOD OF SURVEY: digitized

ADJUSTMENT NAME: DATE COORDINATED: 09/11/1987

OR ELLIPSE, MAJOR AXIS: MINOR AXIS: ORIENTATION: (DEGS)

NOTE: AGD84, AUSTRALIAN GEODETIC DATUM 1984 USING THE AUSTRALIAN NATIONAL SPHEROID, A = 6378160.000, 1/F = 298.25, WITH THE JOHNSTON PILLAR AS THE ORIGIN. COORDINATES ARE BASED ON THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION IN METRES.

NOTE: WGS84 COORDINATES DERIVED USING AGD84 to WGS84 (7 Parameter) TRANSFORMATION. PARAMETERS DX = -116.00000, DY = -50.47000, DZ = 141.69000, RX = -0.23000, RY = -0.39000, RZ = -0.34400, DS = 0.09830 PPM

HISTORIC COORDINATE SYSTEMS

VERTICAL DETAILS

AHD HEIGHT(H): 254.187 AGD84 SPHEROIDAL HEIGHT: 274.69 SEPARATION(N): 20.50
WGS84 SPHEROIDAL HEIGHT: 225.09 SEPARATION(N): -29.10

SELECTED ACCURACY: 12 rootK(mm) ORDER: third

METHOD OF SURVEY: spirit levelling

LINEADJ SECTIONS:

GROUND LEVEL TO MARK:

AUTHORITY WHO ESTABLISHED HEIGHT: Dept of Land Admin.

TCH COVER TO MARK:

SURVEYOR WHO ESTABLISHED HEIGHT: J VINER/E BINGHAM

HATCH COVER TYPE: unknown

A: AHD, AUSTRALIAN HEIGHT DATUM IN METRES

E: GEOID-SPHEROID SEPARATIONS DERIVED FROM THE AUSGEOID93 DIGITAL GEOID MODEL

REFERENCE MARKS

ME	DB NUMBER	TYPE	SETIN	STATUS	DATE	AZIMUTH	TYPE	DISTANCE	TYPE	MARK-RM	STATUS	GL-RM
	3752335	SP	CONC	EST	01/06/1982			15.100	H	-0.331	FINAL	
X2	3752336	SP	CONC	EST	01/06/1982			16.350	H	0.091	FINAL	

AGD84				AMG84			
NAME	DB NUMBER	LATITUDE	LONGITUDE	EASTING	NORTHING	ZN	
	3752335	NO COORDINATES COMPUTED		INSUFFICIENT/PRECISE DATA		AC	
	3752336	NO COORDINATES COMPUTED		INSUFFICIENT/PRECISE DATA		AC	

10 HEIGHT DIFFERENCES

1 SPECIAL NOTES

17 ADJACENT STATIONS

***** END OF STATION SUMMARY *****

5 AUG 95

09:32:23

DEPARTMENT OF LAND ADMINISTRATION

MAPPING AND SURVEY DIVISION

PAGE: 1

GEODETTIC SURVEY SERVICES

/R: LIBGH00

PE OF MARK: Bench Mark

PRIMARY NAME: HO 28

DATABASE NUMBER: 128474

MARK STAMPED: HO28

TERNATE NAMES:

CLASS:

HORIZONTAL DETAILS

AGD84 LATITUDE: 34 31 7.07630
LONGITUDE: 117 27 58.23780
AMG84 EASTING: 542787.379
NORTHING: 6180224.770
ZONE: 50
CONVERGENCE: 0 15 51.03
POINT SCALE: 0 99962256

WGS84 LATITUDE: 34 31 2.72442
LONGITUDE: 117 28 3.69359
UTM EASTING: 542926.942
NORTHING: 6180371.433
ZONE: 50
CONVERGENCE: 0 15 54.09
POINT SCALE: 0.99962271

EXPECTED ACCURACY: 500m ORDER: fifth

METHOD OF SURVEY: digitized

ADJUSTMENT NAME: DATE COORDINATED: 09/11/1987

OR ELLIPSE, MAJOR AXIS: MINOR AXIS: ORIENTATION: (DESS)

NOTE: AGD84, AUSTRALIAN GEODETTIC DATUM 1984 USING THE AUSTRALIAN NATIONAL SPHEROID, A = 6378160.000, 1/F = 298.25, WITH THE JOHNSTON PILLAR AS THE ORIGIN. COORDINATES ARE BASED ON THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION IN METRES.

NOTE: WGS84 COORDINATES DERIVED USING AGD84 to WGS84 (7 Parameter) TRANSFORMATION. PARAMETERS DX= -116.00000, DY= -50.47000
DZ= 141.69000, RX= -0.23000, RY= -0.39000, RZ= -0.34400, DS= 0.09830 PPM

NO HISTORIC COORDINATE SYSTEMS

VERTICAL DETAILS

AHD HEIGHT(M): 243.215 AGD84 SPHEROIDAL HEIGHT: 263.56 SEPARATION(M): 20.34
WGS84 SPHEROIDAL HEIGHT: 273.85 SEPARATION(M): -29.37

EXPECTED ACCURACY: 12 rootK(mm) ORDER: third

METHOD OF SURVEY: spirit levelling

INADJ SECTIONS:

GROUND LEVEL TO MARK:

AUTHORITY WHO ESTABLISHED HEIGHT: Dept of Land Admin.

HATCH COVER TO MARK:

SURVEYOR WHO ESTABLISHED HEIGHT: J VINER/E BINGHAM

HATCH COVER TYPE: unknown

NOTE: AHD, AUSTRALIAN HEIGHT DATUM IN METRES

NOTE: GEOID-SPHEROID SEPARATIONS DERIVED FROM THE AUSGEOID93 DIGITAL GEOID MODEL

REFERENCE MARKS

NAME	DB NUMBER	TYPE	SETIN	STATUS	DATE	AZIMUTH	TYPE	DISTANCE	TYPE	MARK-RM	STATUS	GL-RM
M1	3752333	SP	CONC	EST	01/06/1982			14.000	H	0.065	FINAL	
	3752334	SP	CONC	EST	01/06/1982			14.800	H	-0.324	FINAL	

IE	DB NUMBER	LATITUDE	LONGITUDE	EASTING	NORTHING	ZN
	3752333	NO COORDINATES COMPUTED		INSUFFICIENT PRECISE DATA		AC
02	3752334	NO COORDINATES COMPUTED		INSUFFICIENT PRECISE DATA		AC

HEIGHT DIFFERENCES

0 SPECIAL NOTES

ADJACENT STATIONS

***** END OF STATION SUMMARY *****

DATE: 10 NOV 95
TIME: 11:31:39
USER: LIWJBOO

DEPARTMENT OF LAND ADMINISTRATION
MAPPING AND SURVEY DIVISION
GEODETIC SURVEY SERVICES

PAGE: 1

TYPE OF MARK: Bench Mark

PRIMARY NAME: HO 38

DATABASE NUMBER: 128484

MARK STAMPED: HO38

ALTERNATE NAMES:

CLASS:

HORIZONTAL DETAILS

AGD84 LATITUDE: 34 32 25.53380
LONGITUDE: 117 12 58.37980
AMG84 EASTING: 519839.889
NORTHING: 6177885.520
ZONE: 50
CONVERGENCE: 0 7 21.33
POINT SCALE: 0.99960485

WGS84 LATITUDE: 34 32 21.19402
LONGITUDE: 117 13 3.83959
UTM EASTING: 519979.268
NORTHING: 6178032.161
ZONE: 50
CONVERGENCE: 0 7 24.42
POINT SCALE: 0.99960492

EXPECTED ACCURACY: 500m ORDER: fifth

METHOD OF SURVEY: digitized

ADJUSTMENT NAME: DATE COORDINATED: 09/11/1987

ERROR ELLIPSE, MAJOR AXIS: MINOR AXIS: ORIENTATION: (DEGS)

NOTE: AGD84, AUSTRALIAN GEODETIC DATUM 1984 USING THE AUSTRALIAN NATIONAL SPHEROID, A = 6378160.000, 1/F = 298.25, WITH THE JOHNSTON PILLAR AS THE ORIGIN. COORDINATES ARE BASED ON THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION IN METRES.

NOTE: WGS84 COORDINATES DERIVED USING AGD84 to WGS84 (7 Parameter) TRANSFORMATION. PARAMETERS DX = -116.00000, DY = -50.67000, DZ = 141.69000, RX = -0.23000, RY = -0.39000, RZ = -0.34400, DS = 0.09830 PPM

VERTICAL DETAILS

AHD HEIGHT(M): 249.991 AGD84 SPHEROIDAL HEIGHT: 270.50 SEPARATION(M): 20.51
WGS84 SPHEROIDAL HEIGHT: 220.30 SEPARATION(M): -29.69

EXPECTED ACCURACY: 18 rootK(mm) ORDER: fourth

METHOD OF SURVEY: spirit levelling

LINADJ SECTIONS:

GROUND LEVEL TO MARK:

AUTHORITY WHO ESTABLISHED HEIGHT: Dept of Land Admin.

HATCH COVER TO MARK:

SURVEYOR WHO ESTABLISHED HEIGHT: J VINER/E BINGHAM

HATCH COVER TYPE: none

NOTE: AHD, AUSTRALIAN HEIGHT DATUM IN METRES

NOTE: GEOID-SPHEROID SEPARATIONS DERIVED FROM THE AUSGEOID93 DIGITAL GEOID MODEL

REFERENCE MARKS

NAME	DB NUMBER	TYPE	SETIN	STATUS	DATE	AZIMUTH	TYPE	DISTANCE	TYPE	MARK-RM	STATUS	GL-RM
RM1	946019	SP	CONC	EST	01/06/1982			19.600	H	-0.059	FINAL	
RM2	946020	SP	CONC	EST	01/06/1982			15.650	H	-0.087	FINAL	

— AGD84 —

— AMG84 —

NAME	DB NUMBER	LATITUDE	LONGITUDE	EASTING	NORTHING	ZH
RM1	946019	NO COORDINATES COMPUTED		INSUFFICIENT PRECISE DATA	AC	
RM2	946020	NO COORDINATES COMPUTED		INSUFFICIENT PRECISE DATA	AC	

NO HEIGHT DIFFERENCES

NO SPECIAL NOTES

NO ADJACENT STATIONS

***** END OF STATION SUMMARY *****

DATE: 10 NOV 95
TIME: 11:31:51
USER: LIWJBOO

DEPARTMENT OF LAND ADMINISTRATION
MAPPING AND SURVEY DIVISION
GEODETIC SURVEY SERVICES

PAGE: 1

TYPE OF MARK: Bench Mark

PRIMARY NAME: HO 111

DATABASE NUMBER: 148224

MARK STAMPED: HO111

ALTERNATE NAMES:

CLASS:

HORIZONTAL DETAILS

AGD84 LATITUDE: 34 30 45.04770
LONGITUDE: 117 3 55.32010
AMG84 EASTING: 506000.000
NORTHING: 6181000.000
ZONE: 50
CONVERGENCE: 0 2 13.33
POINT SCALE: 0.99960044

WGS84 LATITUDE: 34 30 40.71349
LONGITUDE: 117 4 0.77959
UTM EASTING: 506139.268
NORTHING: 6181146.665
ZONE: 50
CONVERGENCE: 0 2 16.42
POINT SCALE: 0.99960046

EXPECTED ACCURACY: 100m ORDER: third

METHOD OF SURVEY: scaled

ADJUSTMENT NAME: DATE COORDINATED: 01/01/0001

ERROR ELLIPSE, MAJOR AXIS: MINOR AXIS: ORIENTATION: (DEGS)

NOTE: AGD84, AUSTRALIAN GEODETIC DATUM 1984 USING THE AUSTRALIAN NATIONAL SPHEROID, A = 6378160.000, 1/F = 298.25, WITH THE JOHNSTON PILLAR AS THE ORIGIN. COORDINATES ARE BASED ON THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION IN METRES.

NOTE: WGS84 COORDINATES DERIVED USING AGD84 to WGS84 (7 Parameter) TRANSFORMATION. PARAMETERS DX= -116.00000, DY= -50.67000
DZ= 141.69000, RX= -0.23000, RY= -0.39000, RZ= -0.34400, DS= 0.09830 PPM

VERTICAL DETAILS

AHD HEIGHT(M): 237.814 AGD84 SPHEROIDAL HEIGHT: 258.57 SEPARATION(M): 20.76
WGS84 SPHEROIDAL HEIGHT: 208.15 SEPARATION(M): -29.66

EXPECTED ACCURACY: 12 rootK(mm) ORDER: third

METHOD OF SURVEY: spirit levelling

LINADJ SECTIONS: 3620-3621,

GROUND LEVEL TO MARK:

AUTHORITY WHO ESTABLISHED HEIGHT: Dept of Land Admin.

HATCH COVER TO MARK:

SURVEYOR WHO ESTABLISHED HEIGHT: J.PAYNE

HATCH COVER TYPE: none

NOTE: AHD, AUSTRALIAN HEIGHT DATUM IN METRES

NOTE: GEOID-SPHEROID SEPARATIONS DERIVED FROM THE AUSGEOID93 DIGITAL GEOID MODEL

REFERENCE MARKS

NAME	DB NUMBER	TYPE	SETIN	STATUS	DATE	AZIMUTH	TYPE	DISTANCE	TYPE	MARK-RH	STATUS	GL-RH
M1	856457	SP		EST	01/11/1982			15.100	H	-0.091	PROVISIONAL	
M2	856458	SP		EST	01/11/1982			15.180	H	-0.210	PROVISIONAL	

NAME	DB NUMBER	LATITUDE	LONGITUDE	EASTING	NORTHING	ZN
M1	856457	NO COORDINATES COMPUTED		INSUFFICIENT PRECISE DATA	AC	
M2	856458	NO COORDINATES COMPUTED		INSUFFICIENT PRECISE DATA	AC	

NO HEIGHT DIFFERENCES

NO SPECIAL NOTES

NO ADJACENT STATIONS

***** END OF STATION SUMMARY *****
***** END OF LISTING *****

06 OCT 95

15:21:11

LIWJ800

DEPARTMENT OF LAND ADMINISTRATION

MAPPING AND SURVEY DIVISION

GEODETTIC SURVEY SERVICES

PAGE: 1

NAME OF MARK: Bench Mark

PRIMARY NAME: UE 29

DATABASE NUMBER: 128149

MARK STAMPED: UE29

ALTERNATE NAMES:

CLASS:

HORIZONTAL DETAILS

GD84 LATITUDE: 34 33 12.17570
LONGITUDE: 117 8 8.66980
AMG84 EASTING: 512453.621
NORTHING: 6176461.700
ZONE: 50
CONVERGENCE: 0 4 37.16
POINT SCALE: 0.99960191

WGS84 LATITUDE: 34 33 7.84004
LONGITUDE: 117 8 14.13129
UTM EASTING: 512592.942
NORTHING: 6176608.329
ZONE: 50
CONVERGENCE: 0 4 40.25
POINT SCALE: 0.99960195

EXPECTED ACCURACY: 500mm ORDER: fifth

METHOD OF SURVEY: digitized

ADJUSTMENT NAME: DATE COORDINATED: 09/11/1987

ERROR ELLIPSE, MAJOR AXIS: MINOR AXIS: ORIENTATION: (DEGS)

NOTE: AGD84, AUSTRALIAN GEODETTIC DATUM 1984 USING THE AUSTRALIAN NATIONAL SPHEROID, A = 6378160.000, 1/F = 298.25, WITH THE JOHNSTON PILLAR AS THE ORIGIN. COORDINATES ARE BASED ON THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION IN METRES.

NOTE: WGS84 COORDINATES DERIVED USING AGD84 to WGS84 (7 Parameter) TRANSFORMATION. PARAMETERS DX= -116.00000, DY= -50.47000
DZ= 141.69000, RX= -0.23000, RY= -0.39000, RZ= - , DS= 0.09830 PPM

VERTICAL DETAILS

AHD HEIGHT(M): 198.116 AGD84 SPHEROIDAL HEIGHT: 218.64 SEPARATION(M): 20.52
WGS84 SPHEROIDAL HEIGHT: 168.26 SEPARATION(M): -29.86

EXPECTED ACCURACY: 3 rootk(mm) ORDER: precise

METHOD OF SURVEY: spirit levelling

INADJ SECTIONS: 894- 908, 908-2241,

ROUND LEVEL TO MARK:

AUTHORITY WHO ESTABLISHED HEIGHT: Dept of Land Admin.

TCH COVER TO MARK:

SURVEYOR WHO ESTABLISHED HEIGHT: J. SOKOLOWSKY

HATCH COVER TYPE: none

NOTE: AHD, AUSTRALIAN HEIGHT DATUM IN METRES

NOTE: GEOID-SPHEROID SEPARATIONS DERIVED FROM THE AUSGEOID93 DIGITAL GEOID MODEL

NO REFERENCE MARKS

HEIGHT DIFFERENCES

NO SPECIAL NOTES

ADJACENT STATIONS

***** END OF STATION SUMMARY *****

DATE: 06 OCT 95
TIME: 15:21:19
USER: LIWJBOO

DEPARTMENT OF LAND ADMINISTRATION
MAPPING AND SURVEY DIVISION
GEODETIC SURVEY SOURCES

PAGE: 1

TYPE OF MARK: Bench Mark

MARK NAME: UB 30

DATABASE NUMBER: 128150

MARK STAMPED: UB30

MARK NAME:

CLASS:

HORIZONTAL DETAILS

AGD84 LATITUDE: 34 32 37.15500
LONGITUDE: 117 7 9.25570
AMG84 EASTING: 510940.741
NORTHING: 6177542.330
ZONE: 50
CONVERGENCE: 0 4 3.40
POINT SCALE: 0.99960148

WGS84 LATITUDE: 34 32 32.81968
LONGITUDE: 117 7 14.71671
UTM EASTING: 511080.049
NORTHING: 6177688.968
ZONE: 50
CONVERGENCE: 0 4 6.49
POINT SCALE: 0.99960151

EXPECTED ACCURACY: 500m ORDER: fifth

METHOD OF SURVEY: digitized

ADJUSTMENT NAME: DATE COORDINATES: 09/11/1987

MAJOR ELLIPSE, MAJOR AXIS: MINOR AXIS: ORIENTATION: (DEGS)

NOTE: AGD84, AUSTRALIAN GEODETIC DATUM 1984 USING THE AUSTRALIAN NATIONAL SPHEROID, A = 6378160.000, 1/F = 298.25, WITH THE JOHNSTON PILLAR AS THE ORIGIN. COORDINATES ARE BASED ON THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION IN METRES.

NOTE: WGS84 COORDINATES DERIVED USING AGD84 to WGS84 (7 Parameter) TRANSFORMATION. PARAMETERS DX = -116.00000, DY = -50.47000
DZ = 141.69000, RX = -0.23000, RY = -0.39000, RZ = -0.134400, DS = 0.09830 PPM

VERTICAL DETAILS

AHD HEIGHT(M): 213.393 AGD84 SPHEROIDAL HEIGHT: 233.97 SEPARATION(M): 20.58

WGS84 SPHEROIDAL HEIGHT: 183.58 SEPARATION(M): -29.81

EXPECTED ACCURACY: 3 rootK(mm) ORDER: precise

METHOD OF SURVEY: spirit levelling

LINADJ SECTIONS: 894-908, 908-2241,

GROUND LEVEL TO MARK:

AUTHORITY WHO ESTABLISHED HEIGHT: Dept of Land Admin.

HATCH COVER TO MARK:

SURVEYOR WHO ESTABLISHED HEIGHT: J. SOKOLOWSKY

HATCH COVER TYPE: none

NOTE: AHD, AUSTRALIAN HEIGHT DATUM IN METRES

NOTE: GEOID-SPHEROID SEPARATIONS DERIVED FROM THE AUSGEOID93 DIGITAL GEOID MODEL

REFERENCE MARKS

NAME	DB NUMBER	TYPE	SET IN	STATUS	DATE	AZIMUTH	TYPE	DISTANCE	TYPE	MARK-RM	STATUS	GL-RM
1	4191813	SP	CONC	EST	01/10/1982	110 0 0	E	29.000	H	0.009	FINAL	
2	4191814	SP	CONC	EST	01/10/1982	290 0 0	E	10.000	H	-0.222	FINAL	

NAME	DB NUMBER	LATITUDE	LONGITUDE	EASTING	NORTHING	IN
RM1	4191813	NO COORDINATES COMPUTED		INSUFFICIENT	PRECISE DATA	AC
RM2	4191814	NO COORDINATES COMPUTED		INSUFFICIENT	PRECISE DATA	AC

NO HEIGHT DIFFERENCES

NO SPECIAL NOTES

NO ADJACENT STATIONS

***** END OF STATION SUMMARY *****

DATE: 06 OCT 95
TIME: 15:21:27
USER: LIWJBOO

DEPARTMENT OF LAND ADMINISTRATION
MAPPING AND SURVEY DIVISION
GEODETIC SURVEY SERVICES

PAGE: 1

TYPE OF MARK: Bench Mark

MARK NAME: UB 31

DATABASE NUMBER: 128151

MARK STAMPED: UB31

ALTERNATE NAMES:

CLASS:

HORIZONTAL DETAILS

AGD84 LATITUDE: 34 32 24.81830
LONGITUDE: 117 6 19.85870
AMG84 EASTING: 509682.121
NORTHING: 6177923.729
ZONE: 50
CONVERGENCE: 0 3 35.37
POINT SCALE: 0.99960116

WGS84 LATITUDE: 34 32 20.48345
LONGITUDE: 117 6 25.31961
UTM EASTING: 509821.419
NORTHING: 6178070.370
ZONE: 50
CONVERGENCE: 0 3 38.46
POINT SCALE: 0.99960119

EXPECTED ACCURACY: 500m ORDER: fifth

METHOD OF SURVEY: digitized

ADJUSTMENT NAME: DATE COORDINATED: 09/11/1987

FOR ELLIPSE, MAJOR AXIS: MINOR AXIS: ORIENTATION: (DEGS)

NOTE: AGD84, AUSTRALIAN GEODETIC DATUM 1984 USING THE AUSTRALIAN NATIONAL SPHEROID, A = 6378160.000, 1/F = 298.25, WITH THE JOHNSTON PILLAR AS THE ORIGIN. COORDINATES ARE BASED ON THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION IN METRES.

NOTE: WGS84 COORDINATES DERIVED USING AGD84 to WGS84 (7 Parameter) TRANSFORMATION. PARAMETERS DX = -116.00000, DY = -50.47000, DZ = 141.69000, RX = -0.23000, RY = -0.39000, RZ = -0.134400, DS = 0.09830 PPM

VERTICAL DETAILS

AHD HEIGHT(M): 225.762 AGD84 SPHEROIDAL HEIGHT: 246.37 SEPARATION(M): 20.61
WGS84 SPHEROIDAL HEIGHT: 195.96 SEPARATION(M): -29.80

EXPECTED ACCURACY: 3 rootK(mm) ORDER: precise

METHOD OF SURVEY: spirit levelling

INADJ SECTIONS: 894-908, 908-2241,

GROUND LEVEL TO MARK:

AUTHORITY WHO ESTABLISHED HEIGHT: Dept of Land Admin.

HATCH COVER TO MARK:

SURVEYOR WHO ESTABLISHED HEIGHT: J. SOKOLOWSKY

HATCH COVER TYPE: none

NOTE: AHD, AUSTRALIAN HEIGHT DATUM IN METRES

NOTE: GEOID-SPHEROID SEPARATIONS DERIVED FROM THE AUSGEOID93 DIGITAL GEOID MODEL

REFERENCE MARKS

NAME	DB NUMBER	TYPE	SET IN	STATUS	DATE	AZIMUTH	TYPE	DISTANCE	TYPE	MARK-RM	STATUS	GL-RM
RM1	4191815	SP	CONC	EST	01/10/1982	110 0 0 E		5.000 H		-0.129	FINAL	
	4191816	SP	CONC	EST	01/10/1982	210 0 0 E		5.000 H		0.109	FINAL	

		AGD84		AMG84	
NAME	DB NUMBER	LATITUDE	LONGITUDE	EASTING	NORTHING
RM1	4191815	NO COORDINATES COMPUTED		INSUFFICIENT PRECISE DATA	
RM2	4191816	NO COORDINATES COMPUTED		INSUFFICIENT PRECISE DATA	

HEIGHT DIFFERENCES

SPECIAL NOTES

ADJACENT STATIONS

***** END OF STATION SUMMARY *****

DATE: 06 OCT 95
TIME: 15:21:35
SER: LIUJ800

DEPARTMENT OF LAND ADMINISTRATION
MAPPING AND SURVEY DIVISION
GEODETIC SURVEY SERVICES

PAGE: 1

TYPE OF MARK: Bench Mark

PRIMARY NAME: UB 32

DATABASE NUMBER: 128152

MARK STAMPED: UB32

ALTERNATE NAMES:

CLASS:

HORIZONTAL DETAILS

AGD84 LATITUDE: 34 32 28.38300
LONGITUDE: 117 5 7.53900
AMG84 EASTING: 507838.689
NORTHING: 6177815.670
ZONE: 50
CONVERGENCE: 0 2 54.37
POINT SCALE: 0.99960076

WGS84 LATITUDE: 34 32 24.04911
LONGITUDE: 117 5 13.00016
UTM EASTING: 507977.972
NORTHING: 6177962.309
ZONE: 50
CONVERGENCE: 0 2 57.47
POINT SCALE: 0.99960078

EXPECTED ACCURACY: 500m ORDER: fifth

METHOD OF SURVEY: digitized

ADJUSTMENT NAME:

DATE COORDINATED: 09/11/1987

ERROR ELLIPSE, MAJOR AXIS:

MINOR AXIS:

ORIENTATION: (DEGS)

JTE: AGD84, AUSTRALIAN GEODETIC DATUM 1984 USING THE AUSTRALIAN NATIONAL SPHEROID, A = 6378160.000, 1/F = 298.25, WITH THE JOHNSTON PILLAR AS THE ORIGIN. COORDINATES ARE BASED ON THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION IN METRES.

NOTE: WGS84 COORDINATES DERIVED USING AGD84 to WGS84 (7 Parameter) TRANSFORMATION. PARAMETERS DX= -116.00000, DY= -50.47000
DZ= 141.69000, RX= -0.23000, RY= -0.39000, RZ= -0.134400, DS= 0.09830 PPM

VERTICAL DETAILS

AHD HEIGHT(M): 255.254 AGD84 SPHEROIDAL HEIGHT: 275.87 SEPARATION(M): 20.62
WGS84 SPHEROIDAL HEIGHT: 225.43 SEPARATION(M): -29.83

EXPECTED ACCURACY: 3 rootK(mmm) ORDER: precise

METHOD OF SURVEY: spirit levelling

LINADJ SECTIONS: 894- 908, 908-2241,

GROUND LEVEL TO MARK:

AUTHORITY WHO ESTABLISHED HEIGHT: Dept of Land Admin.

HATCH COVER TO MARK:

SURVEYOR WHO ESTABLISHED HEIGHT: J.SOKOLOWSKY

HATCH COVER TYPE: none

NOTE: AHD, AUSTRALIAN HEIGHT DATUM IN METRES

NOTE: GEOID-SPHEROID SEPARATIONS DERIVED FROM THE AUSGEOID93 DIGITAL GEOID MODEL

NO REFERENCE MARKS

NO HEIGHT DIFFERENCES

NO SPECIAL NOTES

NO ADJACENT STATIONS

***** END OF STATION SUMMARY *****

DATE: 06 OCT 95
TIME: 15:21:43
USER: LHMJBOO

DEPARTMENT OF LAND ADMINISTRATION
MAPPING AND SURVEY DIVISION
GEODETIC SURVEY SERVICES

PAGE: 1

TYPE OF MARK: Bench Mark

PRIMARY NAME: UB 33

DATABASE NUMBER: 128153

MARK STAMPED: UB33

ALTERNATE NAMES:

CLASS:

HORIZONTAL DETAILS

AGD84 LATITUDE: 34 32 12.11960
LONGITUDE: 117 4 4.42940
AMG84 EASTING: 506230.460
NORTHING: 6178317.840
ZONE: 50
CONVERGENCE: 0 2 18.58
POINT SCALE: 0.99960048

WGS84 LATITUDE: 34 32 7.78630
LONGITUDE: 117 4 9.89044
UTM EASTING: 506369.730
NORTHING: 6178464.483
ZONE: 50
CONVERGENCE: 0 2 21.67
POINT SCALE: 0.99960050

EXPECTED ACCURACY: 500m ORDER: fifth

METHOD OF SURVEY: digitized

ADJUSTMENT NAME: DATE COORDINATED: 09/11/1987

ERROR ELLIPSE, MAJOR AXIS: MINOR AXIS: ORIENTATION: (DEGS)

NOTE: AGD84, AUSTRALIAN GEODETIC DATUM 1984 USING THE AUSTRALIAN NATIONAL SPHEROID, A = 6378160.000, 1/F = 298.25, WITH THE JOHNSTON PILLAR AS THE ORIGIN. COORDINATES ARE BASED ON THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION IN METRES.

NOTE: WGS84 COORDINATES DERIVED USING AGD84 to WGS84 (7 Parameter) TRANSFORMATION. PARAMETERS DX= -116.00000, DY= -50.47000
DZ= 141.69000, RX= -0.23000, RY= -0.39000, RZ= -0.34400, IDS= 0.09830 PPM

VERTICAL DETAILS

AHD HEIGHT(M): 251.187 AGD84 SPHEROIDAL HEIGHT: 271.84 SEPARATION(M): 20.65

WGS84 SPHEROIDAL HEIGHT: 221.37 SEPARATION(M): -29.82

EXPECTED ACCURACY: 3 rootK(mm) ORDER: precise

METHOD OF SURVEY: spirit levelling

LINADJ SECTIONS: 894-908, 908-2241,

GROUND LEVEL TO MARK:

AUTHORITY WHO ESTABLISHED HEIGHT: Dept of Land Admin.

HATCH COVER TO MARK:

SURVEYOR WHO ESTABLISHED HEIGHT: J.SOKOLOWSKY

HATCH COVER TYPE: none

NOTE: AHD, AUSTRALIAN HEIGHT DATUM IN METRES

NOTE: GEIOD-SPHEROID SEPARATIONS DERIVED FROM THE AUSGEIOD93 DIGITAL GEIOD MODEL

REFERENCE MARKS

NAME	DB NUMBER	TYPE	SETUP	STATUS	DATE	AZIMUTH	TYPE	DISTANCE	TYPE	MARK-RM	STATUS	GL-RM
RM1	4191817	SP	CONC	EST	14/04/1984	95 0 0 E		14.920	H			
RM2	4191818	SP	CONC	EST	14/04/1984	275 0 0 E		13.260	H			

— AGD84 —

— AMG84 —

NAME	DB NUMBER	LATITUDE	LONGITUDE	EASTING	NORTHING	ZN
RM1	4191817	NO COORDINATES COMPUTED		INSUFFICIENT PRECISE DATA		
RM2	4191818	NO COORDINATES COMPUTED		INSUFFICIENT PRECISE DATA		

NO HEIGHT DIFFERENCES

NO SPECIAL NOTES

NO ADJACENT STATIONS

***** END OF STATION SUMMARY *****

DATE: 06 OCT 95
TIME: 15:21:51
USER: LHWJ800

DEPARTMENT OF LAND ADMINISTRATION
MAPPING AND SURVEY DIVISION
GEODETIC SURVEY SERVICES

PAGE: 1

TYPE OF MARK: Bench Mark

PRIMARY NAME: UB 34

DATABASE NUMBER: 128154

MARK: STAMPED: UB34

ALTERNATE NAMES:

CLASS:

HORIZONTAL DETAILS

AGD84 LATITUDE: 34 31 57.90850
LONGITUDE: 117 3 6.31500
AMG84 EASTING: 504749.359
NORTHING: 6178756.451
ZONE: 50
CONVERGENCE: 0 1 45.62
POINT SCALE: 0.99960028

WGS84 LATITUDE: 34 31 53.57577
LONGITUDE: 117 3 11.77593
UTM EASTING: 504888.616
NORTHING: 6178903.097
ZONE: 50
CONVERGENCE: 0 1 48.71
POINT SCALE: 0.99960029

EXPECTED ACCURACY: 500m ORDER: fifth

METHOD OF SURVEY: digitized

ADJUSTMENT NAME: DATE COORDINATED: 09/11/1987

ERROR ELLIPSE, MAJOR AXIS: MINOR AXIS: ORIENTATION: (DEGS)

NOTE: AGD84, AUSTRALIAN GEODETIC DATUM 1984 USING THE AUSTRALIAN NATIONAL SPHEROID, $A = 6378160.000$, $1/F = 298.25$, WITH THE JOHNSTON PILLAR AS THE ORIGIN. COORDINATES ARE BASED ON THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION IN METRES.

NOTE: WGS84 COORDINATES DERIVED USING AGD84 to WGS84 (7 Parameter) TRANSFORMATION. PARAMETERS $DX = -116.00000$, $DY = -50.47000$, $DZ = 141.69000$, $RX = -0.23000$, $RY = -0.39000$, $RZ = -0.34400$, $DS = 0.09830$ PPM

VERTICAL DETAILS

AHD HEIGHT(M): 265.999 AGD84 SPHEROIDAL HEIGHT: 286.68 SEPARATION(M): 20.68
WGS84 SPHEROIDAL HEIGHT: 236.19 SEPARATION(M): -29.81

EXPECTED ACCURACY: 3 rootK(mmm) ORDER: precise

METHOD OF SURVEY: spirit levelling

LINADJ SECTIONS: 894-908, 908-2241, 3620-3621,

GROUND LEVEL TO MARK:

AUTHORITY WHO ESTABLISHED HEIGHT: Dept of Land Admin.

HATCH COVER TO MARK:

SURVEYOR WHO ESTABLISHED HEIGHT: J.SOKOLOWSKY

HATCH COVER TYPE: none

NOTE: AHD, AUSTRALIAN HEIGHT DATUM IN METRES

NOTE: GEOID-SPHEROID SEPARATIONS DERIVED FROM THE AUSGEOID93 DIGITAL GEOID MODEL

REFERENCE MARKS

NAME	DB NUMBER	TYPE	SET IN	STATUS	DATE	AZIMUTH	TYPE	DISTANCE	TYPE	MARK-RM	STATUS	GL-RM
R1	946023	SP	CONC	EST	01/10/1982	280 0 0 E		14.900	H	0.071	PROVISIONAL	
R2	946024	SP	CONC	EST	01/10/1982	100 0 0 E		15.030	H	-0.684	PROVISIONAL	

— AGD84 —

— AMG84 —

NAME	DB NUMBER	LATITUDE	LONGITUDE	EASTING	NORTHING	ZN
R1	946023	NO COORDINATES COMPUTED		INSUFFICIENT PRECISE DATA	AC	
R2	946024	NO COORDINATES COMPUTED		INSUFFICIENT PRECISE DATA	AC	

NO HEIGHT DIFFERENCES

NO SPECIAL NOTES

NO ADJACENT STATIONS

***** END OF STATION SUMMARY *****

01 AUG 95
15:16:32
LIWJBOO

DEPARTMENT OF LAND ADMINISTRATION
MAPPING AND SURVEY DIVISION
GEODETIC SURVEY SERVICES

PAGE: 1

NAME OF MARK: Standard Survey Mark

MARK NAME: MOUNT BARKER 16

DATABASE NUMBER: 108263

MARK STAMPED: MBR16

MARK NAME:

CLASS:

HORIZONTAL DETAILS

AGD84 LATITUDE: 34 22 7.18945
LONGITUDE: 117 30 16.03034
MGS84 EASTING: 546383.302
NORTHING: 6196837.623
ZONE: 50
CONVERGENCE: 0 17 5.20
POINT SCALE: 0.99962652

WGS84 LATITUDE: 34 22 2.82963
LONGITUDE: 117 30 21.47592
UTM EASTING: 546522.890
NORTHING: 6196984.418
ZONE: 50
CONVERGENCE: 0 17 8.24
POINT SCALE: 0.99962668

RED ACCURACY: 15 ppm ORDER: second
METHOD OF SURVEY: geodetic-terrestrial
ADJUSTMENT NAME: WAIBM270 DATE COORDINATED: 07/08/1991
ELLIPSE, MAJOR AXIS: 0.044 MINOR AXIS: 0.025 ORIENTATION: 29 (DEGS)

AGD84, AUSTRALIAN GEODETIC DATUM 1984 USING THE AUSTRALIAN NATIONAL SPHEROID, A = 6378160.000, 1/F = 298.25, WITH THE JOHNSTON PILLAR AS THE ORIGIN. COORDINATES ARE BASED ON THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION IN METRES.
WGS84 COORDINATES DERIVED USING AGD84 to WGS84 (7 Parameter) TRANSFORMATION. PARAMETERS DX= -116.00000, DY= -50.47000, DZ= 141.69000, RX= -0.23000, RY= -0.39000, RZ= -0.34400, DS= 0.09830 PPM

VERTICAL DETAILS

AHD HEIGHT(H): 305.493 AGD84 SPHEROIDAL HEIGHT: 326.25 SEPARATION(N): 20.75
WGS84 SPHEROIDAL HEIGHT: 276.93 SEPARATION(N): -28.56

RED ACCURACY: 12 rootK(mm) ORDER: third
METHOD OF SURVEY: spirit levelling

ADJ SECTIONS:

0 LEVEL TO MARK:

AUTHORITY WHO ESTABLISHED HEIGHT: Dept of Land Admin.

TECH COVER TO MARK:

SURVEYOR WHO ESTABLISHED HEIGHT:

HATCH COVER TYPE: none

AHD, AUSTRALIAN HEIGHT DATUM IN METRES

GEOD-SPHEROID SEPARATIONS DERIVED FROM THE AUSGE01D93 DIGITAL GEOID MODEL

REFERENCE MARKS

DB NUMBER	TYPE	SETIN	STATUS	DATE	AZIMUTH	TYPE	DISTANCE	TYPE	MARK-RM	STATUS	GL-RM
233197	SP	CONC	EST	01/02/1971	47 37 25	A	2.999	H	-0.216	FINAL	-0.150
233198	SP	CONC	EST	01/02/1971	174 17 54	A	3.032	H	-0.250	FINAL	-0.150
233199	SP	CONC	EST	01/02/1971	300 47 38	A	2.983	H	-0.234	FINAL	-0.150

AGD84				MGS84			
DB NUMBER	LATITUDE	LONGITUDE	EASTING	NORTHING	ZONE		
233197	34 22	7.1239	117 30 16.1170	546385.527	6196839.632	50	AC
233198	34 22	7.2874	117 30 16.0421	546383.589	6196834.605	50	AC
233199	34 22	7.1399	117 30 15.9301	546380.749	6196839.162	50	AC

ADJACENT STATIONS

TO STATION	DB NUMBER	I	AZIMUTH	DISTANCE	TYPE	TO STATION	DB NUMBER	I	AZIMUTH	DISTANCE	TYPE
	100573	S	300 47 38.06	11696.555	OBS	MOUNT BARKER 27	108262	S	47 37 25.28	11019.222	OBS

SPECIAL NOTES

DESCRIPTION

Hay Location 1639.

TE: 01 AUG 95
ME: 12:43:39
ER: LIWJBOO

DEPARTMENT OF LAND ADMINISTRATION
MAPPING AND SURVEY DIVISION
GEODETIC SURVEY SERVICES

PAGE: 1

PE OF MARK: Standard Survey Mark

INARY NAME: MOUNT BARKER 23

DATABASE NUMBER: 108156

MARK STAMPED: MBR23

TERNATE NAMES:

CLASS:

HORIZONTAL DETAILS

AGD84 LATITUDE: 34 25 51.06286
LONGITUDE: 117 1 29.46441
AMG84 EASTING: 502283.314
NORTHING: 6190056.960
ZONE: 50
CONVERGENCE: 0 0 50.58
POINT SCALE: 0.99960006

WGS84 LATITUDE: 34 25 46.72703
LONGITUDE: 117 1 34.91895
UTM EASTING: 502422.550
NORTHING: 6190203.697
ZONE: 50
CONVERGENCE: 0 0 53.67
POINT SCALE: 0.99960007

PECTED ACCURACY: 15 ppm ORDER: second

ETHOD OF SURVEY: geodetic-terrestrial

ADJUSTMENT NAME: WAGAN074 DATE COORDINATED: 06/04/1987

FOR ELLIPSE, MAJOR AXIS: 0.042 MINOR AXIS: 0.036 ORIENTATION: 136 (DEGS)

TE: AGD84, AUSTRALIAN GEODETIC DATUM 1984 USING THE AUSTRALIAN NATIONAL SPHEROID, A = 6378160.000, 1/F = 298.25, WITH THE JOHNSTON PILLAR AS THE ORIGIN. COORDINATES ARE BASED ON THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION IN METRES.

TE: WGS84 COORDINATES DERIVED USING AGD84 to WGS84 (7 Parameter) TRANSFORMATION. PARAMETERS DX= -116.00000, DY= -50.47000
DZ= 141.69000, RX= -0.23000, RY= -0.39000, RZ= -0.34400, DS= 0.09830 PPM

VERTICAL DETAILS

AHD HEIGHT(M): 272.131 AGD84 SPHEROIDAL HEIGHT: 293.22 SEPARATION(N): 21.09
WGS84 SPHEROIDAL HEIGHT: 242.90 SEPARATION(N): -29.23

PECTED ACCURACY: 12 rootK(mm) ORDER: third

ETHOD OF SURVEY: spirit levelling

INADJ SECTIONS:

UND LEVEL TO MARK:

AUTHORITY WHO ESTABLISHED HEIGHT: Dept of Land Admin.

ATCH COVER TO MARK:

SURVEYOR WHO ESTABLISHED HEIGHT:

HATCH COVER TYPE: none

AHD, AUSTRALIAN HEIGHT DATUM IN METRES

TE: GEOID-SPHEROID SEPARATIONS DERIVED FROM THE AUSGEOID93 DIGITAL GEOID MODEL

REFERENCE MARKS

REF	DB NUMBER	TYPE	SETIN	STATUS	DATE	AZIMUTH	TYPE	DISTANCE	TYPE	MARK-RM	STATUS	GL-RM
1	233265	SP	CONC	EST	01/06/1971	65 8 17	A	2.875	H	-0.220	FINAL	-0.150
2	233266	SP	CONC	EST	01/06/1971	212 14 52	A	2.894	H	-0.247	FINAL	-0.150
3	233267	SP	CONC	EST	01/06/1971	358 56 49	A	2.900	H	-0.247	FINAL	-0.150

— AGD84 —

— AMG84 —

REF	DB NUMBER	LATITUDE	LONGITUDE	EASTING	NORTHING	ZN
1	233265	34 25 51.0236	117 1 29.5666	502285.921	6190058.167	50 AC
2	233266	34 25 51.1423	117 1 29.4039	502281.769	6190054.513	50 AC
3	233267	34 25 50.9688	117 1 29.4623	502283.261	6190059.858	50 AC

ADJACENT STATIONS

TO STATION	DB NUMBER	I	AZIMUTH	DISTANCE	TYPE	TO STATION	DB NUMBER	I	AZIMUTH	DISTANCE	TYPE
MBERTON 3	100594	S	346 25 9.68	13756.145	OBS	S 161	108155	S	65 8 16.56	2521.129	OBS
MOUNT BARKER 24	108157	S	358 56 49.06	21208.710	OBS	MOUNT BARKER 53	108160	S	162 15 8.11	5599.564	OBS
MOUNT BARKER 54	108161	S	31 36 10.92	8439.256	OBS	810278/9	155780	T	56 12 9.77	11034.035	OBS
1278/5TS 1	155781	T	36 16 9.93	13418.670	OBS	880250/30T 1	155935	T	211 16 14.50	10700.490	OBS

DATE: 01 AUG 95
TIME: 12:43:46
USER: LIWJB00

DEPARTMENT OF LAND ADMINISTRATION
MAPPING AND SURVEY DIVISION
GEODETIC SURVEY SERVICES

PAGE:

TYPE OF MARK: **Standard Survey Mark**

PRIMARY NAME: **MOUNT BARKER 51**

DATABASE NUMBER: **108158**

MARK STAMPED: **MBR51**

ALTERNATE NAMES:

CLASS:

HORIZONTAL DETAILS

AGD84 LATITUDE: 34 31 51.86713
LONGITUDE: 117 12 55.48054
AMG84 EASTING: 519768.201
NORTHING: 6178922.690
ZONE: 50
CONVERGENCE: 0 7 19.58
POINT SCALE: 0.99960482

WGS84 LATITUDE: 34 31 47.52700
LONGITUDE: 117 13 0.93971
UTM EASTING: 519907.579
NORTHING: 6179069.338
ZONE: 50
CONVERGENCE: 0 7 22.67
POINT SCALE: 0.99960488

EXPECTED ACCURACY: **15 ppm** ORDER: **second**

METHOD OF SURVEY: **geodetic-terrestrial**

ADJUSTMENT NAME: WAGAN074 DATE COORDINATED: 06/04/1987

ERROR ELLIPSE, MAJOR AXIS: 0.037 MINOR AXIS: 0.035 ORIENTATION: 57 (DEGS)

NOTE: AGD84, AUSTRALIAN GEODETIC DATUM 1984 USING THE AUSTRALIAN NATIONAL SPHEROID, A = 6378160.000, 1/F = 298.25, WITH THE JOHNSTON PILLAR AS THE ORIGIN. COORDINATES ARE BASED ON THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION IN METRES.

NOTE: WGS84 COORDINATES DERIVED USING AGD84 to WGS84 (7 Parameter) TRANSFORMATION. PARAMETERS DX= -116.00000, DY= -50.47000, DZ= 141.69000, RX= -0.23000, RY= -0.39000, RZ= -0.34400, DS= 0.09830 PPM

VERTICAL DETAILS

AHD HEIGHT(H): **-269.988** AGD84 SPHEROIDAL HEIGHT: 290.54 SEPARATION(N): 20.55

WGS84 SPHEROIDAL HEIGHT: 240.35 SEPARATION(N): -29.63

EXPECTED ACCURACY: **12 rootK(mm)** ORDER: **third**

METHOD OF SURVEY: **spirit levelling**

LINADJ SECTIONS:

GROUND LEVEL TO MARK:

AUTHORITY WHO ESTABLISHED HEIGHT: Dept of Land Admin.

HATCH COVER TO MARK:

SURVEYOR WHO ESTABLISHED HEIGHT: J PAYNE

HATCH COVER TYPE: none

NOTE: AHD, AUSTRALIAN HEIGHT DATUM IN METRES

NOTE: GEOID-SPHEROID SEPARATIONS DERIVED FROM THE AUSGEOID93 DIGITAL GEOID MODEL

REFERENCE MARKS

NAME	DB NUMBER	TYPE	SET IN	STATUS	DATE	AZIMUTH	TYPE	DISTANCE	TYPE	MARK-RM	STATUS	GL-RM
RM1	233333	SP	CONC	EST	01/11/1982	43 18 58	A	3.945	H	-0.019	FINAL	
RM2	233334	SP	CONC	EST	01/11/1982	140 38 23	A	3.460	H			
RM3	233335	SP	CONC	EST	01/11/1982	268 23 58	A	3.988	H	-0.266	FINAL	

— AGD84 —

— AMG84 —

NAME	DB NUMBER	LATITUDE	LONGITUDE	EASTING	NORTHING	ZN
RM1	233333	34 31 51.7740	117 12 55.5867	519770.912	6178925.553	50 AC
RM2	233334	34 31 51.9539	117 12 55.5666	519770.389	6178920.011	50 AC
RM3	233335	34 31 51.8707	117 12 55.3242	519764.216	6178922.587	50 AC

ADJACENT STATIONS

TO STATION	DB NUMBER	I	AZIMUTH	DISTANCE	TYPE	TO STATION	DB NUMBER	I	AZIMUTH	DISTANCE	TYPE
R 237	100573	S	34 36 21.52	29152.928	OBS	R 239	100588	S	140 38 23.30	19420.597	OBS
MOUNT BARKER 52	108159	S	264 17 59.70	15002.349	OBS		155788	T	289 8 26.12	9450.906	OBS

SPECIAL NOTES

DESCRIPTION

1 - Contact owner prior to entry. MBR51, RM2, Pardelup are co-linear.

01 AUG 95
12:43:54
WJB00

DEPARTMENT OF LAND ADMINISTRATION
MAPPING AND SURVEY DIVISION
GEODETIC SURVEY SERVICES

PAGE: 1

OF MARK: Standard Survey Mark

NAME: MOUNT BARKER 52

DATABASE NUMBER: 108159

MARK STAMPED: MBR52

DATE NAMES:

CLASS:

HORIZONTAL DETAILS

74 LATITUDE: 34 32 39.83274
LONGITUDE: 117 3 10.00834
384 EASTING: 504842.832
NORTHING: 6177465.040
ZONE: 50
CONVERGENCE: 0 1 47.74
POINT SCALE: 0.99960029

WGS84 LATITUDE: 34 32 35.50046
LONGITUDE: 117 3 15.47001
UTM EASTING: 504982.089
NORTHING: 6177611.676
ZONE: 50
CONVERGENCE: 0 1 50.84
POINT SCALE: 0.99960031

ACCURACY: 15 ppm ORDER: second

OF SURVEY: geodetic-terrestrial

AGENT NAME: WAGAN074 DATE COORDINATED: 06/04/1987

LIPSE, MAJOR AXIS: 0.045 MINOR AXIS: 0.027 ORIENTATION: 131 (DEGS)

AGD84, AUSTRALIAN GEODETIC DATUM 1984 USING THE AUSTRALIAN NATIONAL SPHEROID, A = 6378160.000, 1/F = 298.25, WITH THE HUNSTON PILLAR AS THE ORIGIN. COORDINATES ARE BASED ON THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION IN METRES.

WGS84 COORDINATES DERIVED USING AGD84 to WGS84 (7 Parameter) TRANSFORMATION. PARAMETERS DX = -116.00000, DY = -50.47000, DZ = 141.69000, RX = -0.23000, RY = -0.39000, RZ = -0.34400, DS = 0.09830 PPM

VERTICAL DETAILS

AHD HEIGHT(H): 274.523 AGD84 SPHEROIDAL HEIGHT: 295.15 SEPARATION(N): 20.63

WGS84 SPHEROIDAL HEIGHT: 244.64 SEPARATION(N): -29.88

ACCURACY: 12 rootK(mm) ORDER: third

OF SURVEY: spirit levelling

SECTIONS: 3620-3621,

LEVEL TO MARK:

AUTHORITY WHO ESTABLISHED HEIGHT: Dept of Land Admin.

COVER TO MARK:

SURVEYOR WHO ESTABLISHED HEIGHT:

MARK COVER TYPE: concrete

1, AUSTRALIAN HEIGHT DATUM IN METRES

ELLIPSOID-SPHEROID SEPARATIONS DERIVED FROM THE AUSGEOID93 DIGITAL GEOID MODEL

REFERENCE MARKS

DB NUMBER	TYPE	SET IN	STATUS	DATE	AZIMUTH	TYPE	DISTANCE	TYPE	MARK-9M	STATUS	GL-9M
233340	SP	CONC	EST	01/10/1982	94 55 25	A	3.650	H	-0.048	FINAL	-0.200
233341	SP	CONC	EST	01/10/1982	181 47 55	A	3.777	H	-0.142	FINAL	-0.200
233342	SP	CONC	EST	01/10/1982	277 54 5	A	2.305	H	0.000	FINAL	-0.200
233339					353 15 25						

— AGD84 —

— WGS84 —

DB NUMBER	LATITUDE	LONGITUDE	EASTING	NORTHING	ZN
233340	34 32 39.8429	117 3 10.1510	504846.467	6177464.725	50 AC
233341	34 32 39.9553	117 3 10.0037	504842.711	6177461.267	50 AC
233342	34 32 39.8225	117 3 9.9188	504840.550	6177465.358	50 AC
233339	NO COORDINATES COMPUTED				INSUFFICIENT PRECISE DATA AC

ADJACENT STATIONS

STATION	DB NUMBER	I	AZIMUTH	DISTANCE	TYPE	TO STATION	DB NUMBER	I	AZIMUTH	DISTANCE	TYPE
GULLY SOUTH	100394	S	221 56 1.19	14837.982	085	MOUNT. BARKER 51	108158	S	84 23 31.63	15002.349	085
BARKER 53	108160	S	353 15 24.95	7313.613	085	810278/RGW 4	155800	T	105 25 18.27	4242.932	085

DATE: 01 AUG 95
TIME: 12:44:01
USER: LIWJB00

DEPARTMENT OF LAND ADMINISTRATION
MAPPING AND SURVEY DIVISION
GEODETIC SURVEY SERVICES

PAL

TYPE OF MARK: **Standard Survey Mark**

PRIMARY NAME: **MOUNT BARKER 53**

DATABASE NUMBER: **1081**

MARK STAMPED: **MBR53**

ALTERNATE NAMES:

CLASS:

HORIZONTAL DETAILS

AGD84 LATITUDE: 34 28 44.12970
LONGITUDE: 117 2 36.35534
AMG84 EASTING: 503988.220
NORTHING: 6184725.606
ZONE: 50
CONVERGENCE: 0 1 28.51
POINT SCALE: 0.99960020

WGS84 LATITUDE: 34 28 39.
LONGITUDE: 117 2 41.
UTM EASTING: 504127.47
NORTHING: 6184872.30
ZONE: 5
CONVERGENCE: 0 1 31.6
POINT SCALE: 0.9996002

EXPECTED ACCURACY: 15 ppm ORDER: second
METHOD OF SURVEY: geodetic-terrestrial
ADJUSTMENT NAME: WAGANG74 DATE COORDINATED: 06/04/1987
ERROR ELLIPSE, MAJOR AXIS: 0.044 MINOR AXIS: 0.036 ORIENTATION: 122 (DEGS)

NOTE: AGD84, AUSTRALIAN GEODETIC DATUM 1984 USING THE AUSTRALIAN NATIONAL SPHEROID, A = 6378160.000, 1/F = 298.25, WITH T
JOHNSTON PILLAR AS THE ORIGIN. COORDINATES ARE BASED ON THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION IN METRES.
NOTE: WGS84 COORDINATES DERIVED USING AGD84 to WGS84 (7 Parameter) TRANSFORMATION. PARAMETERS DX= -116.00000, DY= -50.470
DZ= 141.69000, RX= -0.23000, RY= -0.39000, RZ= -0.34400, DS= 0.09830 PPM

VERTICAL DETAILS

AHD HEIGHT(M): 282.035 **AGD84** SPHEROIDAL HEIGHT: 302.94 SEPARATION(M): 20.90
WGS84 SPHEROIDAL HEIGHT: 252.55 SEPARATION(M): -29.48

EXPECTED ACCURACY: 12 rootK(mm) ORDER: third
METHOD OF SURVEY: spirit levelling
LINADJ SECTIONS: 3620-3621,

GROUND LEVEL TO MARK: 0.00

AUTHORITY WHO ESTABLISHED HEIGHT: Dept of Land Admin.

HATCH COVER TO MARK:

SURVEYOR WHO ESTABLISHED HEIGHT: J PAYNE

HATCH COVER TYPE: none

NOTE: AHD, AUSTRALIAN HEIGHT DATUM IN METRES

NOTE: GEOID-SPHEROID SEPARATIONS DERIVED FROM THE AUSGEOID93 DIGITAL GEOID MODEL

REFERENCE MARKS

NAME	DB NUMBER	TYPE	SET IN	STATUS	DATE	AZIMUTH	TYPE	DISTANCE	TYPE	MARK-RM	STATUS	GL-RM
RM1	233348	SP	CONC	EST	01/10/1982	342 14 30	A	4.780	H	-0.134	FINAL	-0.100
RM2	233349	SP	CONC	EST	01/10/1982	86 37 10	A	3.694	H	0.087	FINAL	-0.100
RM3	233350	SP	CONC	EST	01/10/1982	249 28 30	A	3.460	H	-0.048	FINAL	-0.100

AGD84				AMG84			
NAME	DB NUMBER	LATITUDE	LONGITUDE	EASTING	NORTHING	ZN	
RM1	233348	34 28 43.9820	117 2 36.2982	503986.764	6184730.157	50	AC
RM2	233349	34 28 44.1226	117 2 36.4999	503991.906	6184725.822	50	AC
RM3	233350	34 28 44.1691	117 2 36.2284	503984.980	6184724.394	50	AC

ADJACENT STATIONS

TO STATION	DB NUMBER	I	AZIMUTH	DISTANCE	TYPE	TO STATION	DB NUMBER	I	AZIMUTH	DISTANCE
MOUNT BARKER 23	108156	S	342 14 30.27	5599.564	OBS	MOUNT BARKER 52	108159	S	173 15 44.01	7313.613
902596/19003-10	3735644	T	206 55 31.52	4098.483	OBS					

SPECIAL NOTES

DESCRIPTION

1 - Contact property owner before entry.MBR 53,Rm1,MBR 23 are co-linear.

01 AUG 95
15:16:52
LIWJ800

DEPARTMENT OF LAND ADMINISTRATION
MAPPING AND SURVEY DIVISION
GEODETIC SURVEY SERVICES

PAGE: 1

OF MARK: Standard Survey Mark

MARK NAME: MOUNT BARKER 80

DATABASE NUMBER: 108285

MARK STAMPED: MBR80

MARK NAME:

CLASS:

HORIZONTAL DETAILS

AGD84 LATITUDE: 34 39 23.04163
LONGITUDE: 117 38 45.03168
MG84 EASTING: 559180.118
NORTHING: 6164856.756
ZONE: 50
CONVERGENCE: 0 22 2.18
POINT SCALE: 0.99964317

WGS84 LATITUDE: 34 39 18.68758
LONGITUDE: 117 38 50.49443
UTM EASTING: 559319.812
NORTHING: 6165003.294
ZONE: 50
CONVERGENCE: 0 22 5.24
POINT SCALE: 0.99964337

MARKED ACCURACY: 15 ppm ORDER: second
METHOD OF SURVEY: geodetic-terrestrial
MARK NAME: WAIBM270 DATE COORDINATED: 07/08/1991
ELLIPSE, MAJOR AXIS: 0.052 MINOR AXIS: 0.029 ORIENTATION: 166 (DEGS)

AGD84, AUSTRALIAN GEODETIC DATUM 1984 USING THE AUSTRALIAN NATIONAL SPHEROID, A = 6378160.000, 1/F = 298.25, WITH THE JOHNSTON PILLAR AS THE ORIGIN. COORDINATES ARE BASED ON THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION IN METRES.
WGS84 COORDINATES DERIVED USING AGD84 to WGS84 (7 Parameter) TRANSFORMATION. PARAMETERS DX= -116.00000, DY= -50.47000
DZ= 141.69000, RX= -0.23000, RY= -0.39000, RZ= -0.34400, DS= 0.09830 PPM

VERTICAL DETAILS

AHD HEIGHT(H): 403.820 AGD84 SPHEROIDAL HEIGHT: 423.23 SEPARATION(N): 19.41
WGS84 SPHEROIDAL HEIGHT: 373.56 SEPARATION(N): -30.26

MARKED ACCURACY: 12 rootK(mm) ORDER: third
METHOD OF SURVEY: spirit levelling

MARK SECTIONS:

LEVEL TO MARK:

AUTHORITY WHO ESTABLISHED HEIGHT: Dept of Land Admin.

MARK COVER TO MARK:

SURVEYOR WHO ESTABLISHED HEIGHT:

MARK COVER TYPE: none

AHD, AUSTRALIAN HEIGHT DATUM IN METRES

AGD-SPHEROID SEPARATIONS DERIVED FROM THE AUSGEOID93 DIGITAL GEOID MODEL

REFERENCE MARKS

DB NUMBER	TYPE	SEIN	STATUS	DATE	AZIMUTH	TYPE	DISTANCE	TYPE	MARK-RM	STATUS	GL-RM
233399	SP	CONC	LOC	10/04/1991	62 16 34	A	1.566	H	-0.146	FINAL	0.060
233400	SP	CONC	LOC	10/04/1991	227 59 54	A	2.594	H	-0.308	FINAL	0.060
233401	SP	CONC	LOC	10/04/1991	291 27 4	A	3.778	H	-0.710	FINAL	0.060
233402					2 52 14						

AGD84

WGS84

DB NUMBER	LATITUDE	LONGITUDE	EASTING	NORTHING	ZN
233399	34 39 23.0180	117 38 45.0861	559181.508	6164857.475	50 AC
233400	34 39 23.0980	117 38 44.9560	559178.180	6164855.033	50 AC
233401	34 39 22.9968	117 38 44.8936	559176.612	6164858.160	50 AC
233402	NO COORDINATES COMPUTED		INSUFFICIENT PRECISE DATA		

ADJACENT STATIONS

TO STATION	DB NUMBER	I	AZIMUTH	DISTANCE	TYPE	TO STATION	DB NUMBER	I	AZIMUTH	DISTANCE	TYPE
	100588	S	267 35 7.11	27159.884	OBS	R 240	100589	S	63 15 15.80	8397.741	OBS
	113239	S	99 58 14.44	24793.427	OBS	MOUNT BARKER 32T	113252	S	13 48 10.02	4783.501	OBS
BARKER 56	113260	S	25 5 28.79	3555.971	OBS						

APPENDIX 2

Geographic Coordinates (WGS84) and Ellipsoidal Heights for Observed Points

Kent2 adjusted coordinates

***** Adjusted Coordinates *****

Projection Group: Geographic
 Zone Name: Global
 Linear Units: meter
 Angular Units: degrees
 Datum Name: WGS-84

Station Short Name	Station ID	Latitude	Longitude	Ortho. Height	Ellip. Height
1129		34°31'47.52911" S	117°13'00.94013" E	0.00000	240.44030
MB16		34°22'02.82963" S	117°30'21.47592" E	0.00000	276.93000
MB21		34°30'27.63188" S	117°27'32.80272" E	0.00000	209.53831
MB23		34°25'46.72703" S	117°01'34.91895" E	0.00000	242.90000
MB51		34°31'47.52700" S	117°13'00.93971" E	0.00000	240.35000
MB52		34°32'35.50046" S	117°03'15.47001" E	0.00000	244.64000
MB80		34°39'18.68758" S	117°38'50.49443" E	0.00000	373.56000
QB01		34°32'34.24584" S	117°03'06.18347" E	0.00000	241.73313
QB02		34°30'40.13249" S	117°01'09.58113" E	0.00000	215.27864
QB03		34°27'10.10924" S	117°03'29.48866" E	0.00000	211.14333
QB04		34°33'06.54232" S	117°04'47.22403" E	0.00000	208.00278
QB05		34°28'56.34541" S	117°05'55.98571" E	0.00000	206.63464
QB06		34°28'47.76251" S	117°04'26.61253" E	0.00000	221.01011
QB07		34°28'55.37584" S	117°06'37.16052" E	0.00000	198.38264
QB08		34°31'22.75527" S	117°05'55.08760" E	0.00000	218.57124
QB09		34°27'01.77824" S	117°05'28.36590" E	0.00000	187.97162
QB10		34°32'00.55448" S	117°07'27.43020" E	0.00000	183.91909
QB11		34°28'56.80339" S	117°07'44.36424" E	0.00000	186.54226
QB12		34°26'59.24784" S	117°07'33.52457" E	0.00000	192.58550
QB13		34°28'10.49761" S	117°09'30.39737" E	0.00000	201.99598
QB14		34°31'30.02544" S	117°08'53.92614" E	0.00000	188.63456
QB15		34°30'26.45469" S	117°12'03.50143" E	0.00000	174.19808
QB16		34°29'50.44517" S	117°10'59.41531" E	0.00000	224.08921
QB17		34°31'29.10934" S	117°09'48.82984" E	0.00000	202.94122
QB18		34°28'46.70078" S	117°11'18.57514" E	0.00000	198.24517
QB19		34°32'03.69448" S	117°11'54.62226" E	0.00000	176.92790
QB20		34°29'11.35862" S	117°09'12.62519" E	0.00000	204.63822
QB21		34°30'25.41187" S	117°14'34.02532" E	0.00000	206.81999
QB220001		34°31'59.81920" S	117°07'27.72985" E	0.00000	182.89277
QB23		34°32'41.03626" S	117°13'50.85596" E	0.00000	215.34723
QB24		34°33'56.40539" S	117°12'42.23614" E	0.00000	193.94491
QB25		34°34'27.02507" S	117°14'42.24486" E	0.00000	197.65695
WB01		34°26'14.14845" S	117°31'05.57565" E	0.00000	220.15884
WB02		34°28'35.22817" S	117°32'05.55362" E	0.00000	235.70499
WB03		34°29'23.78645" S	117°33'51.96907" E	0.00000	223.09388
WB04		34°30'51.00334" S	117°32'12.70921" E	0.00000	225.35153
WB05		34°33'36.58991" S	117°33'43.93363" E	0.00000	236.32660
WB06		34°32'05.17332" S	117°35'04.28260" E	0.00000	204.90135
WB07		34°31'29.76381" S	117°26'34.06197" E	0.00000	212.98906
WB08		34°32'11.16670" S	117°23'49.05842" E	0.00000	202.32147
WB09		34°29'35.40617" S	117°23'23.49468" E	0.00000	202.40360
WB10		34°26'51.45186" S	117°23'49.39250" E	0.00000	223.18323
WB11		34°27'55.91796" S	117°25'19.22771" E	0.00000	222.18222
WB12		34°28'35.52466" S	117°27'20.15527" E	0.00000	234.02125

Kent2 adjusted coordinates

WB13	34°26'36.74392" S	117°29'01.00408" E	0.00000	226.81179
WB14	34°29'53.78873" S	117°29'49.41257" E	0.00000	211.97660
WB15	34°31'56.20939" S	117°30'09.57967" E	0.00000	224.12295
WB16	34°32'58.12524" S	117°32'03.01583" E	0.00000	242.52089
WB17	34°28'39.40354" S	117°20'57.98890" E	0.00000	192.22067
WB18	34°30'35.84183" S	117°22'13.04582" E	0.00000	197.03534
WB19	34°28'37.71957" S	117°18'47.53781" E	0.00000	192.47597
WB20	34°28'10.02300" S	117°32'30.27119" E	0.00000	234.35624
WB22	34°30'58.79251" S	117°25'34.35579" E	0.00000	203.21485
WB23	34°29'14.25096" S	117°22'55.67958" E	0.00000	197.13281
WB24	34°26'59.51260" S	117°25'45.83695" E	0.00000	227.53249
WB25	34°28'35.67657" S	117°29'58.18253" E	0.00000	224.84915
WB26	34°28'35.49007" S	117°25'19.95177" E	0.00000	222.45899

APPENDIX 3

AMG Coordinates for Observed Points

KENT2.AMG

519768.212	6178922.625	50	290.627
546383.302	6196837.623	50	326.246
542004.703	6181309.306	50	259.239
502283.314	6190056.960	50	293.220
519768.201	6178922.691	50	290.537
504842.832	6177465.041	50	295.151
559180.118	6164856.757	50	423.234
504606.161	6177503.809	50	292.248
501634.913	6181019.756	50	265.785
505205.898	6187487.449	50	261.455
507180.660	6176507.338	50	258.486
508940.584	6184212.309	50	256.936
506661.217	6184478.624	50	271.350
509990.824	6184241.087	50	248.662
508913.279	6179702.652	50	268.958
508239.289	6187741.818	50	238.219
511266.003	6178535.768	50	234.282
511704.879	6184195.090	50	236.788
511432.907	6187816.334	50	242.766
514411.600	6185617.543	50	252.161
513472.209	6179473.148	50	238.936
518308.967	6181422.896	50	224.366
516676.875	6182535.158	50	274.268
514871.921	6179499.207	50	253.215
517169.138	6184497.696	50	248.377
518076.680	6178428.174	50	227.158
513955.389	6183743.622	50	254.848
522147.182	6181446.596	50	256.912
511273.668	6178558.407	50	233.255
521036.885	6177271.679	50	265.541
519283.096	6174953.983	50	244.217
522338.719	6174003.915	50	247.888
547470.109	6189090.896	50	269.602
548977.803	6184737.406	50	285.201
551683.936	6183226.963	50	272.565
549138.135	6180554.267	50	274.926
551435.691	6175441.156	50	285.952
553499.501	6178245.394	50	254.432
540498.512	6179402.189	50	262.756
536287.011	6178144.363	50	252.196
535653.894	6182944.644	50	252.199
536334.175	6187992.169	50	272.867
538618.213	6185997.229	50	271.860
541697.761	6184763.895	50	283.661
544287.702	6188410.633	50	276.331
545493.197	6182335.281	50	261.588
545988.744	6178561.912	50	273.797
548870.290	6176639.922	50	292.175
531949.021	6184683.187	50	242.057
533850.423	6181089.857	50	246.901
528621.679	6184745.949	50	242.376
549612.461	6185510.423	50	283.825
538980.422	6180362.713	50	252.993
534946.986	6183598.971	50	246.929
539304.421	6187731.762	50	277.163
545728.722	6184740.196	50	274.409
538631.601	6184778.257	50	272.160

APPENDIX 4

AHD for Ground Control Points

Road Centre-lines

AHD FOR GROUND CONTROL POINTS

Station	Ellipsoidal Height	Separation	AHD
1129	240.440	-29.626	270.066
MB16	276.930	-28.544	305.474
WB21	209.538	-29.297	238.835
MB23	242.900	-29.209	272.109
MB51	240.350	-29.626	269.976
MB52	244.640	-29.881	274.521
MB80	373.560	-30.275	403.835
QB01	241.733	-29.882	271.615
QB02	251.279	-29.711	280.990
QB03	211.143	-29.321	240.464
QB04	208.003	-29.908	237.911
QB05	206.635	-29.458	236.093
QB06	221.010	-29.466	250.476
QB07	198.383	-29.446	227.829
QB08	218.571	-29.692	248.263
QB09	187.972	-29.284	217.256
QB10	183.919	-29.730	213.649
QB11	186.542	-29.431	215.973
QB12	192.586	-29.254	221.840
QB13	201.996	-29.333	231.329
QB14	188.635	-29.648	218.283
QB15	174.198	-29.496	203.694
QB16	224.089	-29.447	253.536
QB17	202.941	-29.632	232.573
QB18	198.245	-29.333	227.578
QB19	176.928	-29.673	206.601
QB20	204.638	-29.427	234.065
QB21	206.820	-29.455	236.275
QB22	182.893	-29.728	212.621
QB23	215.347	-29.711	245.347
QB24	193.995	-29.876	223.871
QB25	197.657	-29.900	227.557
WB01	220.159	-28.885	249.044
WB02	235.705	-29.095	264.800
WB03	223.094	-29.175	252.269
WB04	225.352	-29.323	254.675
WB05	236.327	-29.626	265.953
WB06	204.901	-29.456	234.357
WB07	212.989	-29.418	242.407
WB08	202.321	-29.524	231.845
WB09	202.404	-29.251	231.655
WB10	223.183	-28.999	252.182

AHD FOR GROUND CONTROL POINTS Cont'd

Station	Ellipsoidal Height	Separation	AHD
WB11	222.182	-29.090	251.272
WB12	234.021	-29.137	263.158
WB13	226.812	-28.974	255.786
WB14	211.977	-29.223	241.200
WB15	224.123	-29.431	253.554
WB16	242.521	-29.551	272.072
WB17	192.221	-29.185	221.406
WB18	197.035	-29.373	226.408
WB19	192.476	-29.235	221.711
WB20	234.356	-29.059	263.415
WB21	209.538	-29.297	238.835
WB22	203.215	-29.374	232.589
WB23	197.133	-29.222	222.355
WB24	227.532	-29.009	256.541
WB25	224.849	-29.124	253.973
WB26	222.459	-29.147	251.606

ROAD CENTRE-LINE ELEVATIONS

Station	AHD	
HO 28 O/S	243.660	Centre line of road
HO 29 O/S	253.977	"
HO 31 O/S	251.459	"

UE 34 O/S	265.559	Centre line of road
UE 33 O/S	250.862	"
UE 32 O/S	250.864	"
UE 31 O/S	225.597	"
UE 30 O/S	213.898	"
UE 29 O/S	199.156	"
HO 38 O/S	250.751	"
HO 111 O/S	238.299	"
MBR 53 O/S	281.550	"