

APPENDIX C

NETWORK #2 ADJUSTMENT REPORTS

2005

GEODETTIC CONTROL DENSIFICATION
AND RESTORATION

of

JEFFERSON COUNTY, KENTUCKY

JUNE 2005

Jacobi, Toombs and Lanz, Inc.
401 West Main Street, Suite 600
Louisville, Kentucky 40202



Network Adjustment Report

Project : 0260-LOJICE-05

User name	tbooker	Date & Time	8:45:42 AM 6/23/2005
Coordinate System	US State Plane 1983	Zone	Kentucky North 1601
Project Datum	NAD 1983 (Conus)		
Vertical Datum		Geoid Model	GEOID99 (Conus)
Coordinate Units	US survey feet		
Distance Units	US survey feet		
Height Units	US survey feet		

Adjustment Style Settings - 95% Confidence Limits

Residual Tolerances

To End Iterations : 0.000033sft
Final Convergence Cutoff : 0.016404sft

Covariance Display

Horizontal

Propagated Linear Error [E] : U.S.
Constant Term [C] : 0.00000000sft
Scale on Linear Error [S] : 1.96

Three-Dimensional

Propagated Linear Error [E] : U.S.
Constant Term [C] : 0.00000000sft
Scale on Linear Error [S] : 1.96
Elevation Errors were used in the calculations.

Adjustment Controls

Compute Correlations for Geoid : False
Horizontal and Vertical adjustment performed

Set-up Errors

GPS
Error in Height of Antenna : 0.000sft
Centering Error : 0.000sft

[Back to top](#)

Statistical Summary

Successful Adjustment in 1 iteration(s)

Network Reference Factor : 1.20

Chi Square Test ($\alpha=95\%$) : PASS

Degrees of Freedom : 22.00

GPS Observation Statistics

Reference Factor : 1.23

Redundancy Number (r) : 21.12

Individual GPS Observation Statistics

Observation ID	Reference Factor	Redundancy Number
B13	1.63	2.19
B15	0.76	1.71
B16	1.25	2.15
B28	0.94	2.19
B37	0.83	1.31
B39	1.81	2.15
B40	0.85	1.90
B52	0.94	2.32
B61	1.65	2.06
B63	0.95	1.82
B73	0.87	1.32

Geoid Model Statistics

Reference Factor : 0.30

Redundancy Number (r) : 0.88

The GPS height errors exceed the geoid errors. Further scaling of the geoid errors is not recommended.

Weighting Strategies

GPS Observations

User-defined Scalar Applied to All Observations

Scalar : 4.30

Geoid Observations

Alternative Scalar Applied to All Observations

Scalar : 1.00

[Back to top](#)

Adjusted Coordinates

Adjustment performed in **NAD 1983 (Conus)**

Number of Points : 5

Number of Constrained Points : 2

Horizontal and Elevation Only : 2

Adjusted Grid Coordinates

Errors are reported using 1.96σ .

Point Name	Northing	N error	Easting	E error	Elevation	e error	Fix
AZI060-2005	239406.989sft	0.020sft	1298845.313sft	0.018sft	696.598sft	0.203sft	
STA060-2005	239444.832sft	0.025sft	1299826.460sft	0.021sft	672.158sft	0.201sft	
STA049-2003	230622.890sft	0.000sft	1289663.020sft	0.000sft	720.820sft	0.000sft	N E e
AZI8624-2001	236504.860sft	0.000sft	1303550.230sft	0.000sft	673.710sft	0.000sft	N E e
STA029-2001	246862.135sft	0.030sft	1297346.951sft	0.029sft	652.921sft	0.201sft	

Adjusted Geodetic Coordinates

Errors are reported using 1.96σ .

Point Name	Latitude	N error	Longitude	E error	Height	h error	Fix
AZI060-2005	38°09'04.94094"N	0.020sft	85°26'16.23738"W	0.018sft	586.927sft	0.131sft	
STA060-2005	38°09'05.43992"N	0.025sft	85°26'03.96155"W	0.021sft	562.479sft	0.128sft	
STA049-2003	38°07'36.92506"N	0.000sft	85°28'09.72429"W	0.000sft	611.189sft	0.116sft	Lat Long e
AZI8624-2001	38°08'36.84934"N	0.000sft	85°25'16.87943"W	0.000sft	563.955sft	0.116sft	Lat Long e
STA029-2001	38°10'18.44266"N	0.030sft	85°26'36.20297"W	0.029sft	543.323sft	0.129sft	

Coordinate Deltas

Point Name	Δ Northing	Δ Easting	Δ Elevation	Δ Height	Δ Geoid Separation
AZI060-2005	0.002sft	-0.006sft	0.021sft	0.021sft	0.000sft
STA060-2005	0.005sft	-0.005sft	0.021sft	0.021sft	0.000sft
STA049-2003	0.000sft	0.000sft	0.000sft	0.019sft	-0.019sft
AZI8624-2001	0.000sft	0.000sft	0.000sft	0.023sft	-0.023sft
STA029-2001	0.005sft	-0.029sft	0.021sft	0.021sft	0.000sft

[Back to top](#)

Control Coordinate Comparisons

Values shown are control coord minus adjusted coord.

Point Name	Δ Northing	Δ Easting	Δ Elevation	Δ Height
STA049-2003	N/A	N/A	N/A	N/A

AZI8624-2001	N/A	N/A	N/A	N/A
STA029-2001	-0.005sft	0.029sft	-0.021sft	N/A

[Back to top](#)

Adjusted Observations

Adjustment performed in **NAD 1983 (Conus)**

GPS Observations

GPS Transformation Group: <GPS Default>





Azimuth Rotation : 0°00'00.6029" (1.96 σ) : 0°00'00.4086"







Network Scale : 0.99999913 (1.96 σ) : 0.00000147

Number of Observations : 11

Number of Outliers : 0

Observation Adjustment (Critical Tau = 2.94). Any outliers are in **red**.

Obs. ID	From Pt.	To Pt.		Observation	A-posteriori Error (1.96 σ)	Residual	Stand. Residual
B61	STA029-2001	AZI060-2005	Az.	167°53'37.3172"	0°00'00.5821"	0°00'00.4961"	1.00
			Δ Ht.	43.605sft	0.082sft	-0.132sft	-2.08
			Dist.	7604.402sft	0.024sft	0.011sft	0.68
B39 	STA029-2001	STA049-2003	Az.	204°34'47.5472"	0°00'00.3050"	0°00'00.1865"	0.64
			Δ Ht.	67.866sft	0.083sft	0.161sft	2.02
			Dist.	17965.798sft	0.030sft	-0.055sft	-1.82
B13 	AZI060-2005	STA060-2005	Az.	87°03'08.6629"	0°00'04.8150"	0°00'05.9349"	1.44
			Δ Ht.	-24.448sft	0.078sft	-0.043sft	-0.54
			Dist.	981.897sft	0.019sft	0.014sft	0.74
B63 	STA029-2001	STA060-2005	Az.	160°46'25.3228"	0°00'00.5522"	0°00'00.0954"	0.31
			Δ Ht.	19.156sft	0.075sft	0.069sft	1.27
			Dist.	7820.942sft	0.028sft	-0.016sft	-0.61
B28 	AZI060-2005	STA060-2005	Az.	87°03'08.6629"	0°00'04.8150"	-0°00'05.0662"	-1.27
			Δ Ht.	-24.448sft	0.078sft	-0.013sft	-0.13
			Dist.	981.897sft	0.019sft	-0.007sft	-0.30





B52 	AZI8624-2001	STA060-2005	Az.	307°33'47.1430"	0°00'01.0144"	0°00'01.1789"	1.22
			ΔHt.	-1.476sft	0.072sft	0.020sft	0.34
			Dist.	4744.563sft	0.023sft	0.021sft	0.77
B73 	AZI8624-2001	STA029-2001	Az.	328°21'10.1375"	0°00'00.3703"	0°00'00.0394"	0.21
			ΔHt.	-20.631sft	0.070sft	0.040sft	1.18
			Dist.	12073.126sft	0.020sft	0.002sft	0.33
B37 	AZI8624-2001	AZI060-2005	Az.	300°56'20.2370"	0°00'00.7838"	-0°00'00.3174"	-0.90
			ΔHt.	22.973sft	0.073sft	-0.014sft	-0.35
			Dist.	5528.102sft	0.017sft	-0.001sft	-0.07
B15 	STA049-2003	STA060-2005	Az.	48°17'00.5668"	0°00'00.4501"	-0°00'00.3026"	-0.89
			ΔHt.	-48.710sft	0.080sft	0.027sft	0.44
			Dist.	13458.443sft	0.023sft	0.003sft	0.21
B16 	STA049-2003	AZI060-2005	Az.	45°30'40.9183"	0°00'00.4503"	0°00'00.3041"	0.82
			ΔHt.	-24.261sft	0.089sft	-0.003sft	-0.03
			Dist.	12707.541sft	0.025sft	0.020sft	0.86
B40 	STA049-2003	AZI8624-2001	Az.	66°17'11.4517"	0°00'00.4086"	0°00'00.2117"	0.69
			ΔHt.	-47.234sft	0.075sft	0.039sft	0.85
			Dist.	15081.825sft	0.022sft	-0.002sft	-0.13

Geoid Observations

Number of Observations : 5

Number of Outliers : 0

Observation Adjustment (Critical Tau = 2.94). Any outliers are in red.

Observation ID	Point Name	Separation	A-posteriori Error (1.96σ)	Residual	Standardized Residual
G4 	AZI8624-2001	-109.755sft	0.116sft	-0.013sft	-0.25
G3 	STA049-2003	-109.631sft	0.116sft	0.013sft	0.25
G1 	AZI060-2005	-109.671sft	0.155sft	0.000sft	0.00
G2 	STA060-2005	-109.680sft	0.155sft	0.000sft	0.00

G5 	STA029-2001	-109.598sft	0.155sft	0.000sft	0.00
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[Back to top](#)

Histograms of Standardized Residuals

Histogram for U:\Geomatics Software\0260 LOJIC 05 Total\EAST\0260-LOJICE-05

[Back to top](#)

Point Error Ellipses

AZI060-2005	STA060-2005	STA049-2003
Error Ellipse for AZI060-2005	Error Ellipse for STA060-2005	Error Ellipse for STA049-2003
Tick Size: 0.0100sft Horizontal Bivariate Scalar: 2.45σ Vertical Univariate Scalar: 1.96σ		
AZI8624-2001	STA029-2001	
Error Ellipse for AZI8624-2001	Error Ellipse for STA029-2001	
Tick Size: 0.0100sft Horizontal Bivariate Scalar: 2.45σ Vertical Univariate Scalar: 1.96σ		

[Back to top](#)

Covariant Terms

Adjustment performed in **NAD 1983 (Conus)**

From Point	To Point	Components	A-posteriori Error (1.96σ)	Horiz. Precision (Ratio)	3D Precision (Ratio)	
AZI060-2005	STA060-2005	Az.	87°03'08.0600"	0°00'04.8759"	1:50128	1:50128
		ΔHt.	-24.449sft	0.078sft		
		ΔElev.	-24.440sft	0.285sft		
		Dist.	981.898sft	0.020sft		
AZI060-2005	STA049-2003	Az.	225°31'50.4019"	0°00'00.2794"	1:601744	1:601744
		ΔHt.	24.262sft	0.089sft		
		ΔElev.	24.222sft	0.203sft		
		Dist.	12707.552sft	0.021sft		
AZI060-2005	AZI8624-2001	Az.	120°55'42.9694"	0°00'00.7995"	1:328606	1:328606
		ΔHt.	-22.973sft	0.073sft		
		ΔElev.	-22.888sft	0.203sft		

		Dist.	5528.107sft	0.017sft		
AZI060-2005	STA029-2001	Az.	347°53'49.0506"	0°00'00.7219"	1:288138	1:288138
		ΔHt.	-43.604sft	0.082sft		
		ΔElev.	-43.677sft	0.286sft		
		Dist.	7604.409sft	0.026sft		
STA060-2005	STA049-2003	Az.	228°18'17.6317"	0°00'00.3576"	1:598905	1:598905
		ΔHt.	48.711sft	0.080sft		
		ΔElev.	48.662sft	0.201sft		
		Dist.	13458.455sft	0.022sft		
STA060-2005	AZI8624-2001	Az.	127°33'17.4580"	0°00'01.0128"	1:210810	1:210810
		ΔHt.	1.476sft	0.072sft		
		ΔElev.	1.552sft	0.201sft		
		Dist.	4744.567sft	0.023sft		
STA060-2005	STA029-2001	Az.	340°46'44.6413"	0°00'00.6833"	1:261934	1:261934
		ΔHt.	-19.155sft	0.075sft		
		ΔElev.	-19.237sft	0.284sft		
		Dist.	7820.949sft	0.030sft		
STA049-2003	AZI8624-2001	Az.	66°17'10.8488"	0°00'00.0000"	1:0	1:0
		ΔHt.	-47.235sft	0.074sft		
		ΔElev.	-47.110sft	0.000sft		
		Dist.	15081.838sft	0.000sft		
STA049-2003	STA029-2001	Az.	24°33'49.1749"	0°00'00.3058"	1:566603	1:566603
		ΔHt.	-67.866sft	0.083sft		
		ΔElev.	-67.899sft	0.201sft		
		Dist.	17965.813sft	0.032sft		
AZI8624-2001	STA029-2001	Az.	328°21'09.5346"	0°00'00.5387"	1:449804	1:449804
		ΔHt.	-20.631sft	0.071sft		
		ΔElev.	-20.789sft	0.201sft		
		Dist.	12073.137sft	0.027sft		

[Back to top](#)