

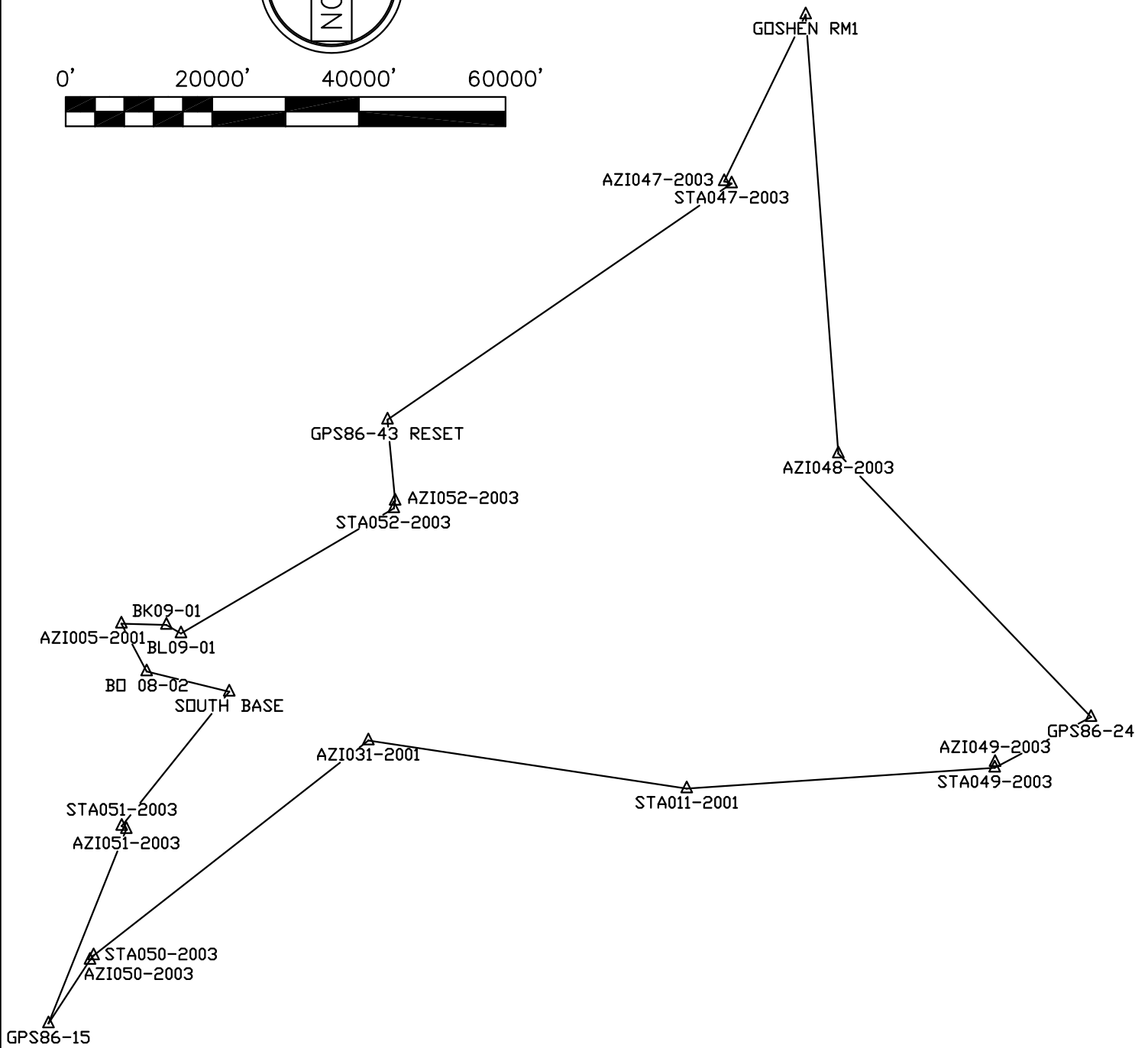
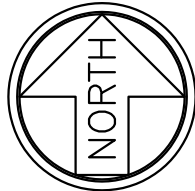
APPENDIX A
LOOP CLOSURES
2003
GEODETIC CONTROL DENSIFICATION
of
JEFFERSON COUNTY, KENTUCKY
JUNE 2003

Fuller, Mossbarger, Scott & May
1901 Nelson Miller Parkway
Louisville, Kentucky 40223-2177



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





GPS NETWORK DENSIFICATION FOR
LOUISVILLE/JEFFERSON COUNTY INFORMATION CONSORTIUM

STATIC NETWORK LOOP # 1 CLOSURE

JACOBI, TOOMBS & LANZ, INC.
CONSULTING ENGINEERS
401 W. MAIN STREET
SUITE 600
LOUISVILLE, INDIANA 40202
(502) 583-5994



EXHIBIT

1 OF 17

SCALE: 1" = 20000'

DATE: 6/19/2003

DRAWN: JAT

CHECKED: HLH

DRW#: 0260.DWG

JOB No. 0260

GPS Loop 1:

STA011-2001; AZI031-2001; STA 050-2003; AZI 050-2003; GPS86-15; AZI 051-2003; SAT 051-2003;
 LOUISVILLE SOUTH BASE; AZI031-2001;BK 09-01; BL09-01; STA 052-2003; AZI 052-2003;
 GPS 86-43 RESET; STA 047-2003; AZI 047-2003; GOSHEN RM1; GPS 86-24 ; AZI 049-2003;
 STA 049 2003; STA 011-2001

Observations:

Baseline ID	Solution ID	From	To	Solution Type
B76	S1	STA011-2001	AZI031-2001	lono free fixed
B63	S2	AZI031-2001	STA 050-2003	lono free fixed
B7	S40	AZI 050-2003	STA 050-2003	L1 fixed
B50	S3	Gps 86-15	AZI 050-2003	L1 fixed
B78	S53	AZI 051-2003	GPS 86-15	lono free fixed
B36	S41	AZI 051-2003	STA 051-2003	L1 fixed
B9	S60	SOUTH BASE	STA 051-2003	lono free fixed
B51	S15	BO 08-02	SOUTHBASE	L1 fixed
B79	S14	AZI005-2001	BO 08-02	L1 fixed
B24	S30	AZI005-2001	BK09-01	L1 fixed
B10	S31	BK 09-01	BL 09-01	L1 fixed
B68	S12	BL 09-01	STA 052-2003	lono free fixed
B6	S35	AZI 052 2003	STA 052-2003	L1 fixed
B69	S47	AZI 052-2003	GPS 86-43 RESET	L1 fixed
B15	S18	GPS 86-43 RESET	STA 047-2003	lono free fixed
B59	S36	AZI 047-2003	STA 047-2003	L1 fixed
B28	S11	AZI 047-2003	GOSHEN RM1	lono free fixed
B16	S8	GOSHEN RM1	AZI 048-2003	lono free fixed
B18	S7	GPS 86-24	AZI 048-2003	lono free fixed
B74	S48	GPS 86-24	AZI 049-2003	L1 fixed
B60	S39	STA 049-2003	AZI 049-2003	L1 fixed
B75	S5	STA 049-2003	STA011-2001	lono free fixed

Passed combinations for loop 1:

	Length	DHoriz	DVert	PPM
S1-S2-S40-S3-S53-S41-S60-S15-S14-S30-S31-S12-S35-S47-S18-S36-S11-S8-S7-S48-S39-S5	479108.866sft	0.047sft	0.004sft	-0.098

GPS NETWORK DENSIFICATION FOR
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STATIC NETWORK LOOP # 1 CLOSURE

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 (502) 583-5994



EXHIBIT
1A OF 17

SCALE: 1" = 20000'

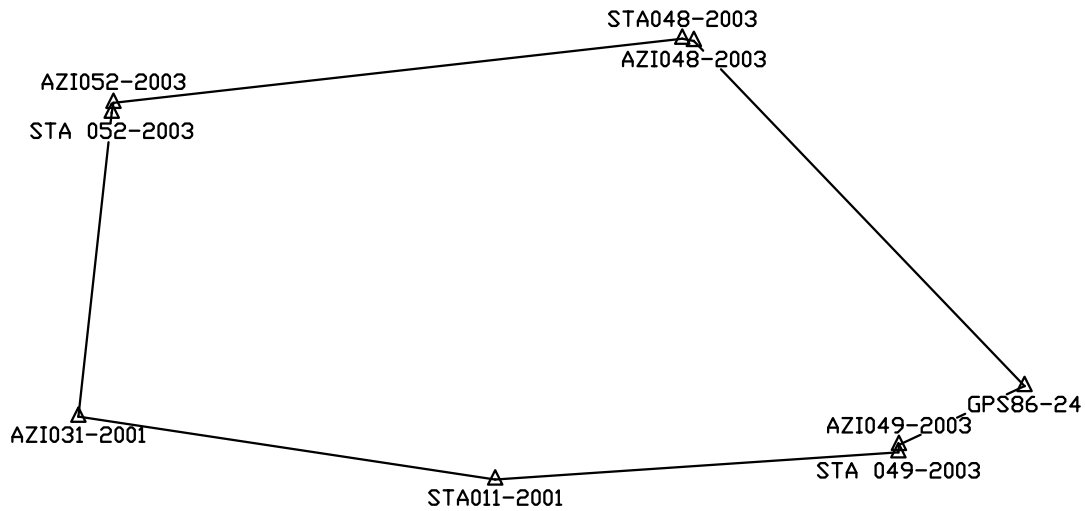
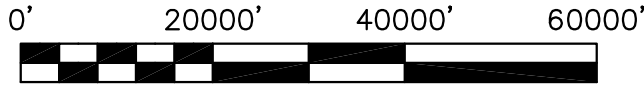
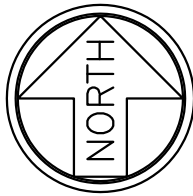
DATE: 6/19/2003

DRAWN: JAT

CHECKED: HLH

DRW#: 0260.DWG

JOB No. 0260



GPS Loop 2:

STA011-2001; AZI031-2001; STA 052-2003; AZI 052-2003; STA 048-2003; AZI 048-2003; GPS86-24; AZI 049-2003; STA 049-2003; STA011-2001

Observations:

Baseline ID	Solution ID	From	To	Solution Type
B76	S1	STA011-2001	AZI031-2001	iono free fixed
B62	S51	AZI031-2001	STA 052-2003	iono free fixed
B6	S35	AZI 052-2003	STA 052-2003	L1 fixed
B83	S44	AZI 052-2003	STA 048-2003	iono free fixed
B5	S61	STA 048-2003	AZI 048-2003	L1 fixed
B18	S7	GPS86-24	AZI 049-2003	L1 fixed
B74	S48	GPS86-24	AZI 050-2003	L1 fixed
B60	S39	STA 049-2003	AZI 049-2003	L1 fixed
B75	S5	STA 049-2003	AZI 049-2003	iono free fixed

Passed combinations for loop 2:

	Length	DHoriz	DVert	PPM
S1-S51-S35-S44-S61-S7-S48-S39-S5	244796.306sft	0.021sft	-0.099sft	0.414

GPS NETWORK DENSIFICATION FOR
LOUISVILLE/JEFFERSON COUNTY INFORMATION CONSORTIUM

STATIC NETWORK LOOP # 2 CLOSURE

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EXHIBIT

2 OF 17

SCALE: 1" = 20000'

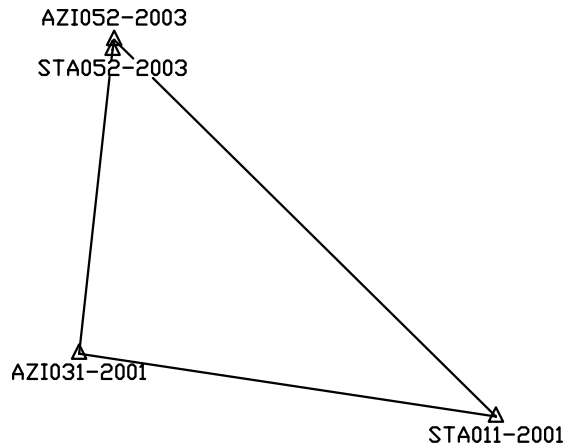
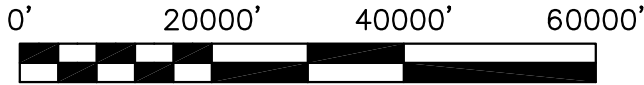
DATE: 6/19/2003

DRAWN: JAT

CHECKED: HLH

DRW#: 0260.DWG

JOB No. 0260



GPS Loop 3:

STA011-2001; AZI031-2001; STA 052-2003; AZI 052-2003; STA 048-2003; STA011-2001

Observations:

Baseline ID	Solution ID	From	To	Solution Type
B76	S1	STA 011-2001	AZI 031-2001	iono free fixed
B62	S51	AZI 031-2001	STA 052-2003	iono free fixed
B6	S35	AZI 052-2003	STA 052-2003	L1 fixed
B83	S44	AZI 052-2003	STA 048-2003	iono free fixed
B19	S38	STA 048-2003	STA 011-2001	iono free fixed

Passed combinations for loop 3:

	Length	DHoriz	DVert	PPM
S1-S51-S35-S44-S38	186329.612sft	0.017sft	-0.087sft	0.477

GPS NETWORK DENSIFICATION FOR
LOUISVILLE/JEFFERSON COUNTY INFORMATION CONSORTIUM

STATIC NETWORK LOOP #3 CLOSURE

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SUITE 600
LOUISVILLE, INDIANA 40202
(502) 583-5994



EXHIBIT

3 OF 17

SCALE: 1" = 20000'

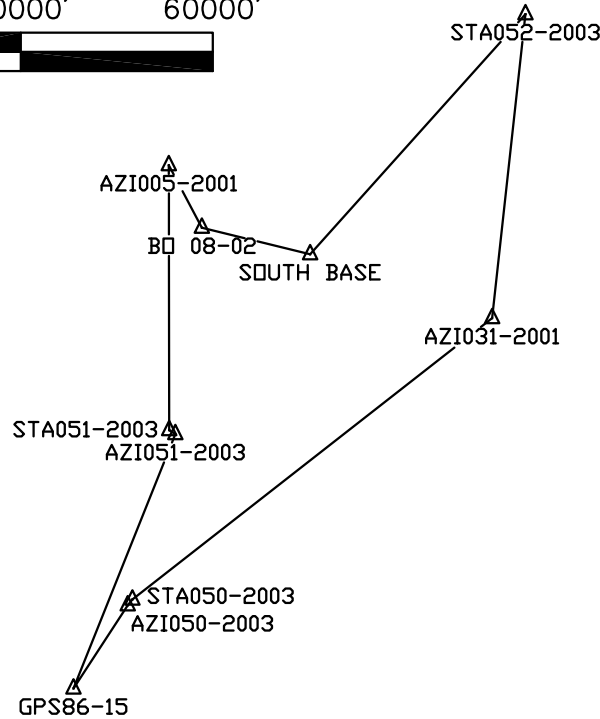
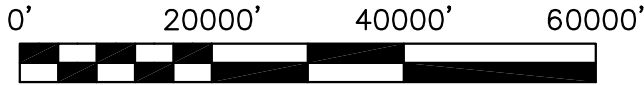
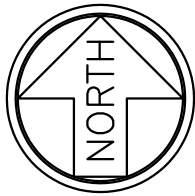
DATE: 6/19/2003

DRAWN: JAT

CHECKED: HLH

DRW#: 0260.DWG

JOB No. 0260



GPS Loop 4:

AZI031-2001; STA 050-2003; AZI 050-2003; GPS86-15; AZI 051-2003; STA 051-2003; AZI005-2001; BO 08-02; SOUTH BASE; STA 052-2003; AZI031-2001

Observations:

Baseline ID	Solution ID	From	To	Solution Type
B63	S2	AZI 031-2001	STA 050-2003	iono free fixed
B7	S40	AZI 050-2003	STA 050-2003	L1 fixed
B50	S3	GPS86-15	STA 050-2003	L1 fixed
B78	S53	AZI 051-2003	GPS86-15	iono free fixed
B36	S41	AZI 051-2003	STA 051-2003	L1 fixed
B37	S45	STA 051-2003	AZI005-2001	iono free fixed
B79	S14	AZI 005-2001	BO 08-02	L1 fixed
B51	S15	BO 08-02	SOUTH BASE	L1 fixed
B82	S57	SOUTH BASE	STA 052-2003	iono free fixed
B62	S51	AZI 031-2001	STA 052-2003	iono free fixed

Passed combinations for loop 4:

	Length	DHoriz	DVert	PPM
S2-S40-S3-S53-S41-S45-S14-S15-S57-S51	200026.853sft	0.045sft	0.0209sft	0.247

GPS NETWORK DENSIFICATION FOR
LOUISVILLE/JEFFERSON COUNTY INFORMATION CONSORTIUM

STATIC NETWORK LOOP #4 CLOSURE

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CONSULTING ENGINEERS
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SUITE 600
LOUISVILLE, INDIANA 40202
(502) 583-5994



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4 OF 17

SCALE: 1" = 20000'

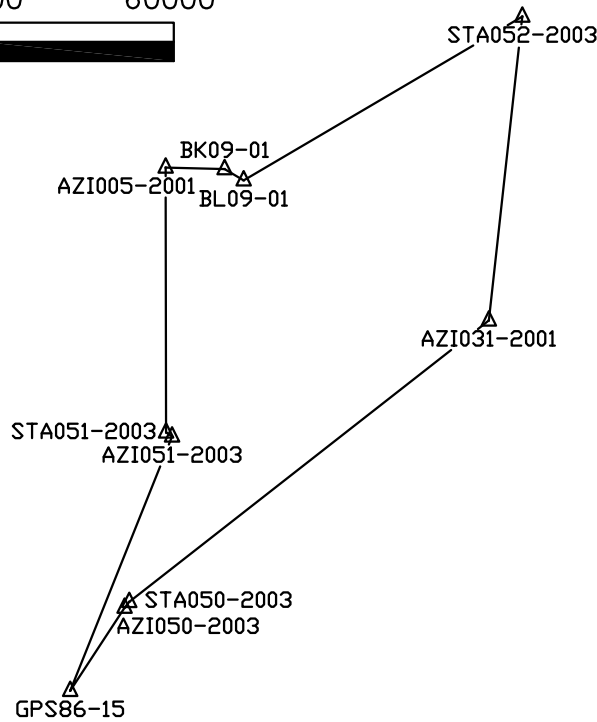
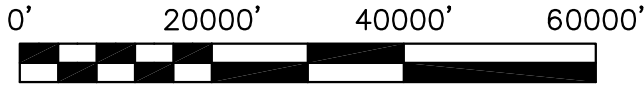
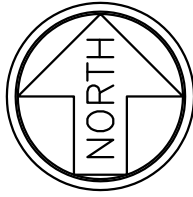
DATE: 6/19/2003

DRAWN: JAT

CHECKED: HLH

DRW#: 0260.DWG

JOB No. 0260



GPS Loop 5:

AZI 031-2001; STA 050-2003; AZI 050-2003; GPS86-15; AZI 051-2003; STA 051-2003;
 AZI 005-2001; BK 09-01; BL 09-01; STA 052-2003; AZI031-2001

Observations:

Baseline ID	Solution ID	From	To	Solution Type
B63	S2	AZI 031-2001	STA 050-2003	iono free fixed
B7	S40	AZI 050-2003	STA 050-2003	L1 fixed
B50	S3	GPS 86-15	STA 050-2003	L1 fixed
B78	S53	AZI 051-2003	GPS 86-15	iono free fixed
B36	S41	AZI 051-2003	STA 051-2003	L1 fixed
B37	S45	STA 051-2003	AZI 005-2001	iono free fixed
B24	S30	AZI 005-2001	BK 09-01	L1 fixed
B10	S31	BK 09-01	BL 09-01	L1 fixed
B68	S12	BL 09-01	STA 052-2003	iono free fixed
B62	S51	AZI 031-2001	STA 052-2003	iono free fixed

Passed combinations for loop 5:

	Length	DHoriz	DVert	PPM
S2-S40-S3-S53-S41-S45-S30-S31-S12-S51	189573.650sft	0.045sft	0.055sft	0.373

GPS NETWORK DENSIFICATION FOR
 LOUISVILLE/JEFFERSON COUNTY INFORMATION CONSORTIUM

STATIC NETWORK LOOP #5 CLOSURE

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 SUITE 600
 LOUISVILLE, INDIANA 40202
 (502) 583-5994



EXHIBIT

5 OF 17

SCALE: 1" = 20000'

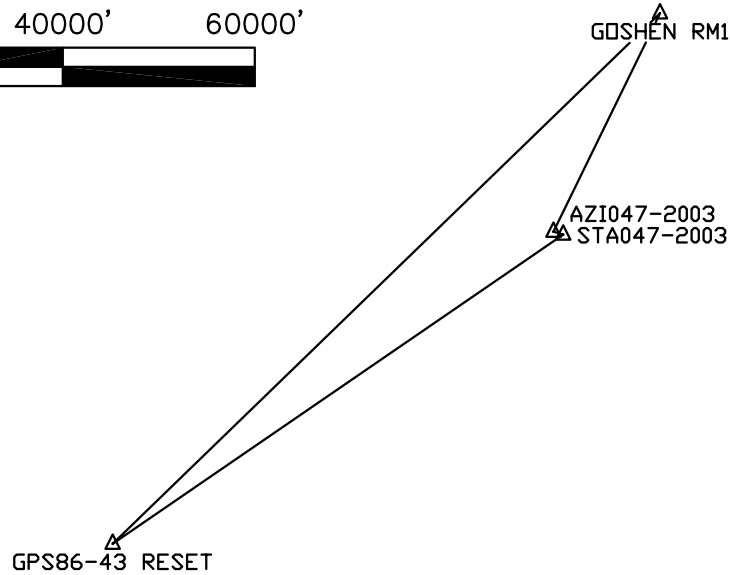
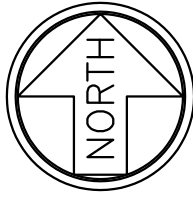
DATE: 6/19/2003

DRAWN: JAT

CHECKED: HLH

DRW#: 0260.DWG

JOB No. 0260



GPS Loop 6:
 GOSHEN RM1; AZI 047-2003; STA 047-2003; GPS 86-43 RESET; GOSHEN

Observations:

Baseline ID	Solution ID	From	To	Solution Type
B28	S11	AZI 047-2003	GOSHEN RM1	iono free fixed
B59	S36	AZI 047-2003	STA 047-2003	L1 fixed
B15	S18	GPS86-43 RESET	STA 047-2003	iono free fixed
B1	S34	STA 052-2003	GPS86-43 RESET	L1 fixed
B30	S63	GOSHEN RM1	STA 053-2003	iono free fixed

Passed combinations for loop 6:

	Length	DHoriz	DVert	PPM
S11-S36-S18-S34-S63	165051.881sft	0.046sft	0.088sft	0.602

GPS NETWORK DENSIFICATION FOR
 LOUISVILLE/JEFFERSON COUNTY INFORMATION CONSORTIUM

STATIC NETWORK LOOP #6 CLOSURE

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 SUITE 600
 LOUISVILLE, INDIANA 40202
 (502) 583-5994



EXHIBIT

6 OF 17

SCALE: 1" = 20000'

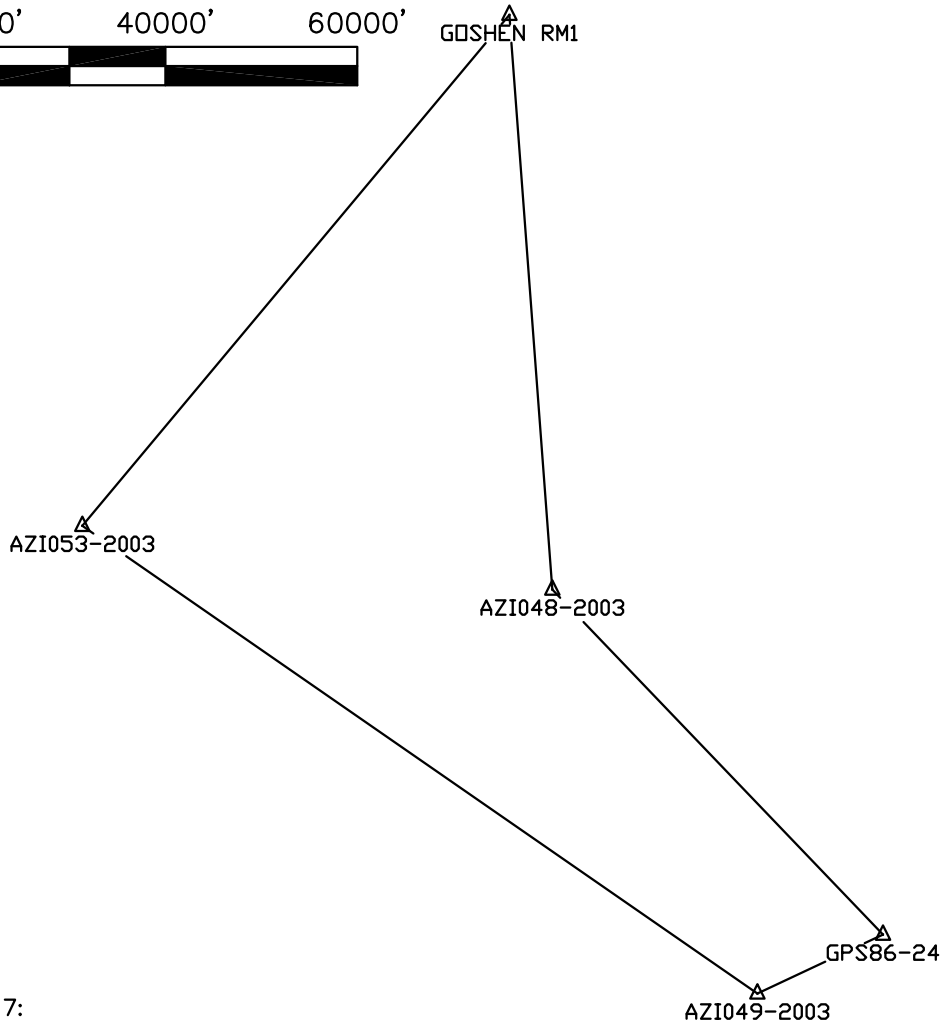
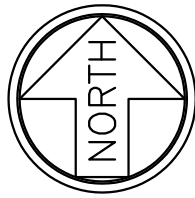
DATE: 6/19/2003

DRAWN: JAT

CHECKED: HLH

DRW#: 0260.DWG

JOB No. 0260



GPS Loop 7:

GPS86-24; AZI 048-2003; GOSHEN RM1; AZI 053-2003; AZI 049-2003; GPS 86-24

Observations:

Baseline ID	Solution ID	From	To	Solution Type
B18	S7	GPS 86-24	AZI 048-2003	iono free fixed
B17	S9	GOSHEN RM1	AZI 048-2003	iono free fixed
B71	S43	AZI 053-2003	GOSHEN RM1	iono free fixed
B57	S62	AZI 053-2003	AZI 049-2003	iono free fixed
B74	S48	GPS 86-24	AZI 049-2003	L1 fixed

Passed combinations for loop 7:

	Length	DHoriz	DVert	PPM
S7-S9-S43-S62-S48	279220.454sft	0.088sft	0.060sft	0.382

GPS NETWORK DENSIFICATION FOR
LOUISVILLE/JEFFERSON COUNTY INFORMATION CONSORTIUM

STATIC NETWORK LOOP #7 CLOSURE

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SUITE 600
LOUISVILLE, INDIANA 40202
(502) 583-5994



EXHIBIT

7 OF 17

SCALE: 1" = 20000'

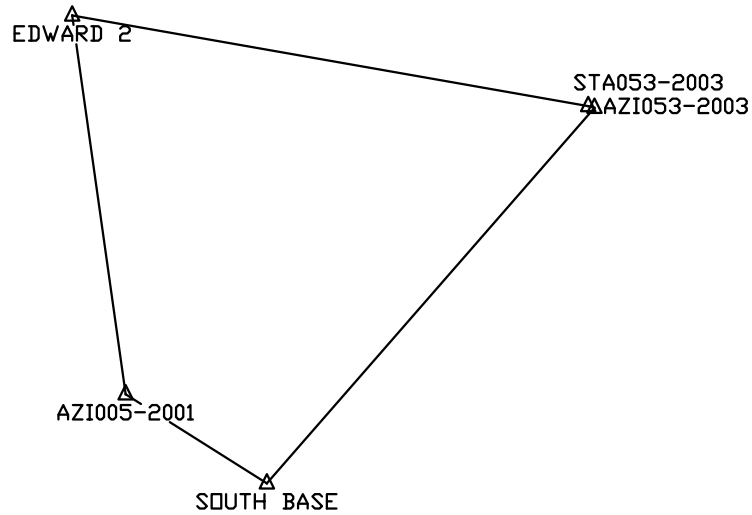
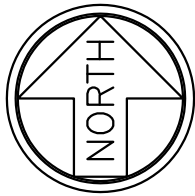
DATE: 6/19/2003

DRAWN: JAT

CHECKED: HLH

DRW#: 0260.DWG

JOB No. 0260



GPS Loop 16:

SOUTH BASE; AZI 053-2003; STA 053-2003; EDWARD 2; AZI005-2001; SOUTH BASE

Observations:

Baseline ID	Solution ID	From	To	Solution Type
B88	S64	SOUTH BASE	AZI 053-2003	lono free fixed
B87	S80	STA 053-2003	AZI 053-2003	L1 fixed
B99	S68	EDWARD 2	STA 053-2003	lono free fixed
B98	S76	EDWARD 2	AZI 005-2001	lono free fixed
B96	S72	SOUTH BASE	AZI 005-2001	lono free fixed

Passed combinations for loop 8:

	Length	DHoriz	DVert	PPM
S64-S80-S68-S76-S72	164402.038sft	0.047sft	0.084sft	0.582

GPS NETWORK DENSIFICATION FOR
LOUISVILLE/JEFFERSON COUNTY INFORMATION CONSORTIUM

STATIC NETWORK LOOP #8 CLOSURE

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CONSULTING ENGINEERS
401 W. MAIN STREET
SUITE 600
LOUISVILLE, INDIANA 40202
(502) 583-5994



EXHIBIT

8 OF 17

SCALE: 1" = 20000'

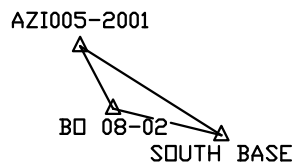
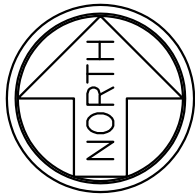
DATE: 6/19/2003

DRAWN: JAT

CHECKED: HLH

DRW#: 0260.DWG

JOB No. 0260



GPS Loop 9:
SOUTH BASE; AZI005-2001; BO 08-02; SOUTH BASE

Observations:

Baseline ID	Solution ID	From	To	Solution Type
B96	S72	SOUTH BASE	AZI005-2001	iono free fixed
B94	S74	AZI005-2001	BO 08-02	L1 fixed
B95	S79	SOUTH BASE	BO 08-02	L1 fixed

Passed combinations for loop 9:

	Length	DHoriz	DVert	PPM
S72-S74-S79	36373.818sft	0.047sft	0.007sft	1.316

GPS NETWORK DENSIFICATION FOR
LOUISVILLE/JEFFERSON COUNTY INFORMATION CONSORTIUM

STATIC NETWORK LOOP #9 CLOSURE

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401 W. MAIN STREET
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EXHIBIT

9 OF 17

SCALE: 1" = 20000'

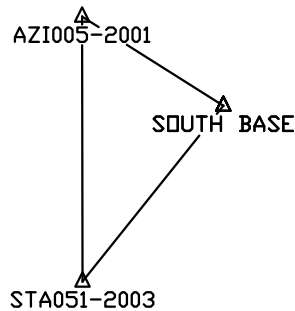
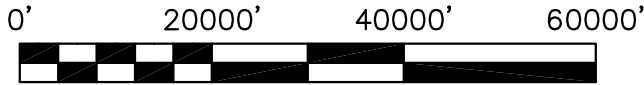
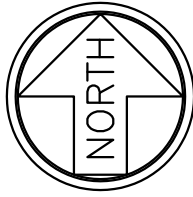
DATE: 6/19/2003

DRAWN: JAT

CHECKED: HLH

DRW#: 0260.DWG

JOB No. 0260



GPS Loop 10:

SOUTH BASE; STA 051-2003; AZI 005-2001; SOUTH BASE

Observations:

Baseline ID	Solution ID	From	To	Solution Type
B93	S72	SOUTH BASE	STA 051-2003	iono free fixed
B97	S75	STA 051-2003	AZI 005-2001	iono free fixed
B96	S72	SOUTH BASE	AZI005-2001	iono free fixed

Passed combinations for loop 10:

	Length	DHoriz	DVert	PPM
S71-S75-S72	68461.663sft	0.091sft	0.123sft	2.236

GPS NETWORK DENSIFICATION FOR
LOUISVILLE/JEFFERSON COUNTY INFORMATION CONSORTIUM

STATIC NETWORK LOOP #10 CLOSURE

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SUITE 600
LOUISVILLE, INDIANA 40202
(502) 583-5994



EXHIBIT

10 OF 17

SCALE: 1" = 20000'

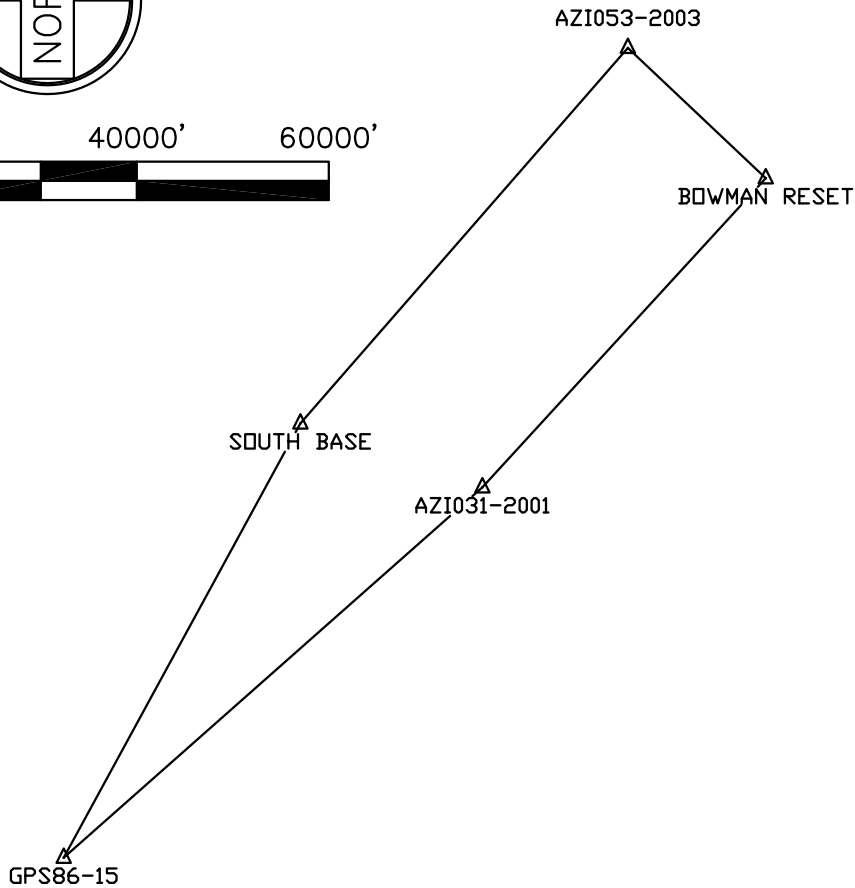
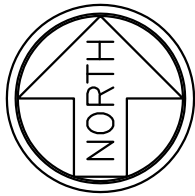
DATE: 6/19/2003

DRAWN: JAT

CHECKED: HLH

DRW#: 0260.DWG

JOB No. 0260



GPS Loop 11:

SOUTH BASE; AZI 053-2003; BOWMAN RESET; AZI031-2001; GPS86-15; SOUTH BASE

Observations:

Baseline ID	Solution ID	From	To	Solution Type
B88	S64	SOUTH BASE	AZI053-2003	lono free fixed
B86	S65	BOWMAN RESET	AZI053-2003	lono free fixed
B103	S67	BOWMAN RESET	AZI 031-2001	lono free fixed
B89	S69	GPS86-15	AZI 031-2001	lono free fixed
B90	S70	SOUTH BASE	GPS86-15	lono free fixed

Passed combinations for loop 11:

	Length	DHoriz	DVert	PPM
S64-S65-S67-S69-S70	225110.710sft	0.037sft	0.129sft	0.595

GPS NETWORK DENSIFICATION FOR
LOUISVILLE/JEFFERSON COUNTY INFORMATION CONSORTIUM

STATIC NETWORK LOOP #11 CLOSURE

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401 W. MAIN STREET
SUITE 600
LOUISVILLE, INDIANA 40202
(502) 583-5994



EXHIBIT

11 OF 17

SCALE: 1" = 20000'

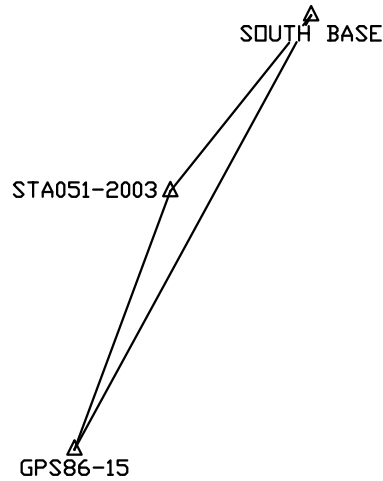
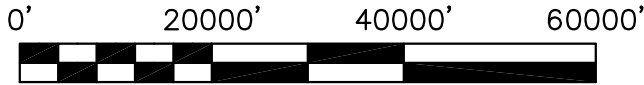
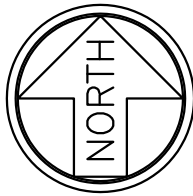
DATE: 6/19/2003

DRAWN: JAT

CHECKED: HLH

DRW#: 0260.DWG

JOB No. 0260



GPS Loop 12:

GPS 86-15; STA 051-2003; SOUTH BASE; GPS 86-15

Observations:

Baseline ID	Solution ID	From	To	Solution Type
B64	S4	GPS 86-15	STA 051-2003	iono free fixed
B9	S60	SOUTH BASE	STA 051-2003	iono free fixed
B90	S79	SOUTH BASE	GPS 86-15	iono free fixed

Passed combinations for loop 12:

	Length	DHoriz	DVert	PPM
S4-S60-S70	103699.215sft	0.038sft	-0.094sft	0.982

GPS NETWORK DENSIFICATION FOR
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STATIC NETWORK LOOP #12 CLOSURE

JACOBI, TOOMBS & LANZ, INC.
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401 W. MAIN STREET
SUITE 600
LOUISVILLE, INDIANA 40202
(502) 583-5994



EXHIBIT

12 OF 17

SCALE: 1" = 20000'

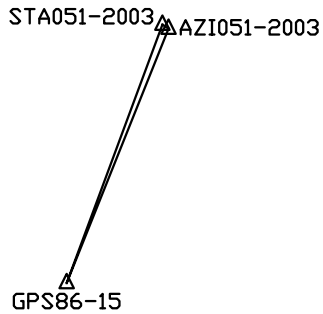
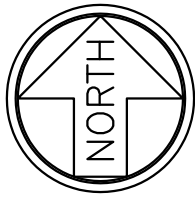
DATE: 6/19/2003

DRAWN: JAT

CHECKED: HLH

DRW#: 0260.DWG

JOB No. 0260



GPS Loop 13:

GPS 86-15; STA 051-2003; AZI 051-2003; GPS 86-15

Observations:

Baseline ID	Solution ID	From	To	Solution Type
B64	S4	GPS 86-15	STA 051-2003	iono free fixed
B36	S41	AZI 051-2003	STA 051-2003	L1 fixed
B78	S53	AZI 051-2003	GPS86-15	iono free fixed

Passed combinations for loop 13:

	Length	DHoriz	DVert	PPM
S4-S41-S53	58015.706sft	0.013sft	-0.043sft	0.772

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(502) 583-5994



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13 OF 17

SCALE: 1" = 20000'

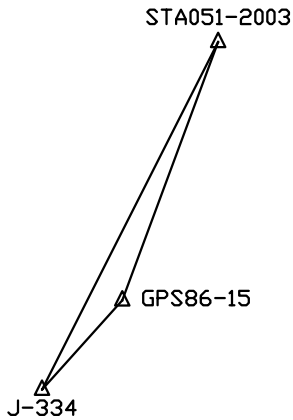
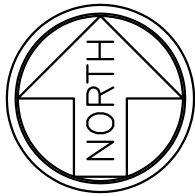
DATE: 6/19/2003

DRAWN: JAT

CHECKED: HLH

DRW#: 0260.DWG

JOB No. 0260



GPS Loop 14:

GPS 86-15; STA 051-2003; J-334; GPS 86-15

Observations:

Baseline ID	Solution ID	From	To	Solution Type
B64	S4	GPS86-15	STA 051-2003	iono free fixed
B92	S77	STA 051-2003	J-334	iono free fixed
B91	S78	GPS 86-15	J-334	L1 fixed

Passed combinations for loop 14:

	Length	DHoriz	DVert	PPM
S4-S77-S79	81823.008sft	0.066sft	-0.061sft	1.100

GPS NETWORK DENSIFICATION FOR
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STATIC NETWORK LOOP #14 CLOSURE

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(502) 583-5994



EXHIBIT

14 OF 17

SCALE: 1" = 20000'

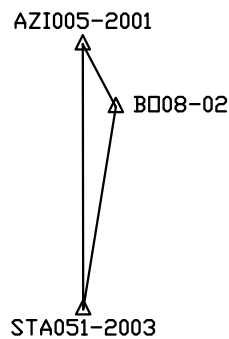
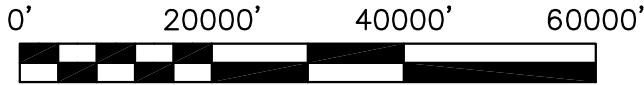
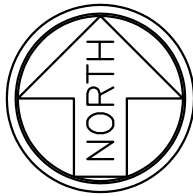
DATE: 6/19/2003

DRAWN: JAT

CHECKED: HLH

DRW#: 0260.DWG

JOB No. 0260



GPS Loop 15:

STA051-2003; BO 08-02; AZI 005-2001; STA 051-2003

Observations:

Baseline ID	Solution ID	From	To	Solution Type
B65	S56	STA 051-2003	BO 08-02	iono free fixed
B79	S14	AZI 005-2001	BO 08-02	L1 fixed
B80	S17	BO 08-02	AZI 031-2001	L1 fixed

Passed combinations for loop 15:

	Length	DHoriz	DVert	PPM
S56-S14-S45	56316.557sft	0.035sft	0.015sft	0.672

GPS NETWORK DENSIFICATION FOR
LOUISVILLE/JEFFERSON COUNTY INFORMATION CONSORTIUM

STATIC NETWORK LOOP #15 CLOSURE

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15 OF 17

SCALE: 1" = 20000'

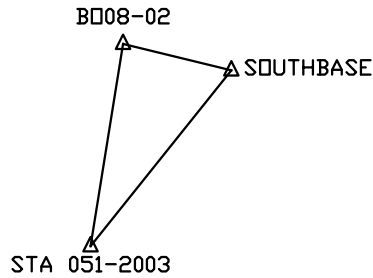
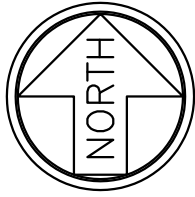
DATE: 6/19/2003

DRAWN: JAT

CHECKED: HLH

DRW#: 0260.DWG

JOB No. 0260



GPS Loop 16:
 STA 051-2003; BO 08-02; SOUTH BASE; STA 051-2003

Observations:

Baseline ID	Solution ID	From	To	Solution Type
B65	S56	STA 051-2003	BO 08-02	iono free fixed
B51	S15	BO 08-02	SOUTH BASE	L1 fixed
B9	S60	SOUTH BASE	STA 051-2003	iono free fixed

Passed combinations for loop 16:

	Length	DHoriz	DVert	PPM
S56-S15-S60	56426.643sft	0.008sft	0.006sft	0.185

GPS NETWORK DENSIFICATION FOR
 LOUISVILLE/JEFFERSON COUNTY INFORMATION CONSORTIUM

STATIC NETWORK LOOP # 16 CLOSURE

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16 OF 17

SCALE: 1" = 20000'

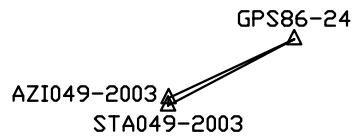
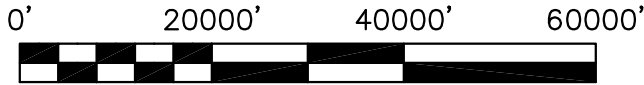
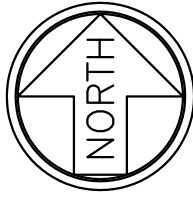
DATE: 6/19/2003

DRAWN: JAT

CHECKED: HLH

DRW#: 0260.DWG

JOB No. 0260



GPS Loop 17:

STA 049-2003; GPS 86-24; AZI 049-2003; STA 049-2003

Observations:

Baseline ID	Solution ID	From	To	Solution Type
B32	S6	GPS 86-24	STA 049-2003	L1 fixed
B74	S48	GPS 86-24	AZI 049-2003	L1 fixed
B60	S39	STA 049-2003	AZI 049-2003	L1 fixed

Passed combinations for loop 17:

	Length	DHoriz	DVert	PPM
S6-S48-S39	30067.505sft	0.007sft	-0.014sft	0.520

GPS NETWORK DENSIFICATION FOR
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STATIC NETWORK LOOP #17 CLOSURE

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EXHIBIT

17 OF 17

SCALE: 1" = 20000'

DATE: 6/19/2003

DRAWN: JAT

CHECKED: HLH

DRW#: 0260.DWG

JOB No. 0260