APPENDIX F

TOPOGRAPHIC SURVEY REPORT

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5485 McCORMICK ROAD
P.O. BOX 528
RAVENNA, OH 44266

PH 330-296-2375

DON TROCCHIO
REGISTERED SURVEYOR

NARRATIVE

This survey task came about SpecPro's (at that time they were known as Vista Technologies) desire to accurately locate numerous soil/water sample and monitor well locations related to the cleanup of the Demolition Area 2 within the Ravenna Army Ammunition Plant, locally referred to as the Ravenna Arsenal. Initial control was transferred to the site in March 2001 via GPS. Location of the samples began in December 2002 and completed in January 2003 under very cold and snowy conditions.

During the survey, about 108 sample locations were located scattered throughout the site within area roughly measuring about 4500' east and west by about 2500' north and south.

Horizontal and vertical control is based on existing monuments known as RAV-1 and RAV-2 established by the U.S. Army Corps of Engineers in 1997 associated with aerial photo mapping of the facility. All coordinates are referenced to the North American Datum of 1983 (NAD83), Ohio State Plane Coordinate System, North Zone, U.S. Survey Foot. The elevations are referenced to the NAVD of 1988 and are shown in feet.

GPS data was transferred to the site using 3 Locus L1 receivers in static mode. Field locations of the samples was performed using a Topcon APL1-A robotic total station with Husky data collector.

Attached is a copy of the file specpro.lst. a text file, of the adjusted raw values generated by Starnet, a 3D adjustment program.

STATE OF OHIO
DONALD
TROCCHIO
6445
REGISTERED
SURVEYOR

9/24/04

Don Trocchio, PS
Ohio Registration No. 6445

Specpro

STAR*NET-LIGHT Version 5.102
Copyright 1996 STARPLUS SOFTWARE, INC.
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Serial Number 20744
Run Date: Fri Sep 24 2004 10:57:46

Summary of Files Used

Project Directory	C:\STAR\JOBS
Input Data File	SPECPRO.DAT
Output Listing (This File)	SPECPRO.LST
Coordinates	SPECPRO.PTS
Project Parameters	SPECPRO.PRJ
Error Log	SPECPRO.ERR
Plot File	SPECPRO.SPL

Adjustment Options

STAR*NET Run Mode	: Adjust Only
Type of Adjustment	: 3D
Input Order for Coordinates	: N,E,Elev
Project Scale Factor	: 0.99989500
Linear Units	: US Feet
Input Order for Angle Stations	: At-From-To
Max Iterations; Convergence Limit	: 10; 0.0100
Correct Zeniths for Curve & Refract	: No
Adjust 3D Obs for Vert Divergence	: No
3D Data Input Mode	: Slope/Zenith
Earth Radius	: 20906000.000 US Feet
Coefficient of Refraction	: 0.070

Default Instrument Standard Error Settings

Distances (Constant)	:	0.0200000 US Feet
Distances (PPM)	:	0.0000000
Angles	:	5.0000000 Seconds
Directions	:	5.0000000 Seconds
Azimuth / Bearings	:	4.0000000 Seconds
Zeniths	:	14.0000000 Seconds
Elevation Differences (Constant)	:	0.0500000 US Feet
Elevation Differences (PPM)	:	0.0000000
Centering Error Instrument	:	0.0100000 US Feet
Centering Error Target	:	0.0100000 US Feet

Adjustment Solution Iterations

Iteration # 1

Changes from Last Iteration (US Feet)

Station	dN	dE	dZ
3	-0.0000	0.0000	0.0000
4	0.0000	-0.0000	-0.0000
5	0.0000	-0.0000	0.0000
8	-0.0000	0.0000	-0.0000

		Specpro	
22	-0.0000	-0.0000	-0.0000
142	9.6555	-25.3204	8.7111
9	0.0083	0.0004	0.0073
10	-0.0063	0.0066	-0.0114
12	-0.0098	-0.0024	0.0008
38	-0.0115	0.0110	0.0018
40	-0.0354	0.0109	-0.0097
72	0.0213	-0.0032	0.0083
73	0.0173	0.0125	0.0415
78	0.0140	-0.0099	0.0820
123	0.0076	-0.0256	0.0732

Iteration # 2

Changes from Last Iteration (US Feet)

Station	dN	dE	dZ
3	0.0000	-0.0000	-0.0000
4	-0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000
8	0.0000	-0.0000	-0.0000
22	-0.0000	-0.0000	-0.0000
142	-0.0106	-0.0305	0.0632
9	0.0000	0.0000	0.0000
10	0.0000	-0.0000	0.0000
12	0.0000	0.0000	0.0000
38	0.0000	-0.0000	0.0000
40	0.0000	-0.0000	0.0000
72	-0.0000	0.0000	-0.0000
73	0.0000	-0.0000	0.0000
78	-0.0000	0.0000	0.0000
123	-0.0000	0.0000	0.0000

Iteration # 3

Changes from Last Iteration (US Feet)

Station	dN	dE	dZ
3	0.0000	-0.0000	-0.0000
4	-0.0000	0.0000	0.0000
5	-0.0000	-0.0000	0.0000
8	-0.0000	0.0000	-0.0000
22	0.0000	0.0000	-0.0000
142	-0.0000	0.0000	-0.0000
9	-0.0000	-0.0000	0.0000
10	-0.0000	-0.0000	-0.0000
12	-0.0000	-0.0000	0.0000
38	-0.0000	0.0000	-0.0000
40	0.0000	0.0000	0.0000
72	0.0000	-0.0000	0.0000
73	-0.0000	0.0000	0.0000
78	0.0000	-0.0000	0.0000
123	0.0000	-0.0000	0.0000

Iteration # 4

Changes from Last Iteration (US Feet)

Station	dN	dE	dZ
3	-0.0000	0.0000	-0.0000
4	0.0000	-0.0000	0.0000

		Specpro	
5	0.0000	0.0000	-0.0000
8	0.0000	-0.0000	-0.0000
22	-0.0000	-0.0000	0.0000
142	0.0000	-0.0000	0.0000
9	-0.0000	-0.0000	-0.0000
10	-0.0000	-0.0000	-0.0000
12	0.0000	-0.0000	0.0000
38	0.0000	0.0000	0.0000
40	0.0000	0.0000	0.0000
72	0.0000	-0.0000	0.0000
73	0.0000	-0.0000	0.0000
78	-0.0000	-0.0000	-0.0000
123	0.0000	0.0000	0.0000

Summary of Unadjusted Input Observations

Number of Entered Stations (US Feet) = 14

Fixed Stations	N	E	Elev	Description
3	558751.5290	2353456.8130	1071.8620	GPSPK N OF LL11
4	558800.3390	2352434.5520	1063.5340	GPSPK S CREEK
5	560144.9580	2354866.1340	1055.3610	GPSNS RR BOX
8	560493.8987	2354941.8337	1039.4680	GPS IR VALLEY
22	560706.3740	2354960.3950	1054.5910	GPSNS F POST

Free Stations	N	E	Elev	Description
142	558800.0000	2353000.0000	1068.0000	PK OPP SIGN

Unused Stations	N	E	Elev	Description
1	551472.4620	2357923.3260	1023.9200	GPS RAV-1
2	558490.7870	2357792.6680	1061.6100	GPS RAV-2
6	559835.0760	2356591.0510	1020.1090	GPSNS ISLAND
7	559837.0000	2356571.0000	1019.8000	DA2-102 TOP
13	559837.0000	2356571.0000	1019.6000	DA2-102 BOT
11	559895.6540	2356890.9960	1018.5690	GPSNS N SHORE
14	559883.0000	2356891.0000	1018.0000	DA2-103 TOP
15	559883.0000	2356891.0000	1017.5000	DA2-103 BOT

Number of Angle Observations = 34

At	From	To	Angle	StdErr
5	8	9	16-22-21.50	26.97
5	8	10	225-31-38.00	16.11
5	8	10	225-31-25.00	16.11
5	8	12	177-01-23.00	15.80
5	8	12	177-01-24.00	15.80
5	8	12	177-01-25.50	15.80
5	8	12	177-01-23.00	15.80
5	8	12	177-01-22.00	15.80
5	8	22	357-16-56.00	8.73
5	8	22	357-17-07.50	8.73
5	8	22	357-17-08.00	8.73
12	5	38	79-37-04.00	10.78
12	5	38	79-37-06.00	10.78
12	5	38	79-37-02.00	10.78
10	5	40	216-46-48.00	13.73
10	5	40	216-46-46.00	13.73
10	5	40	216-46-43.00	13.73
9	22	72	88-27-21.00	8.92
9	22	73	90-18-02.00	8.93
9	22	73	90-18-02.00	8.93

			Specpro	
9	22	73	90-17-48.50	8.93
9	22	78	330-38-15.00	7.86
9	22	78	330-38-20.00	7.86
9	22	78	330-38-10.00	7.86
9	22	5	202-58-29.00	33.08
9	22	5	202-58-50.00	33.08
73	9	72	60-53-22.00	113.51
78	9	22	302-02-18.00	11.61
78	9	22	302-02-21.00	11.61
78	9	22	302-02-18.00	11.61
78	9	123	237-01-20.00	17.83
78	9	123	237-00-59.50	17.83
123	22	78	72-33-39.00	17.97
142	4	3	187-51-36.50	11.15

Number of Distance Observations (US Feet) = 51

>From	To	Distance	StdErr	HI	HT	Scale	Flags
5	8	357.4800	0.0245	5.670	5.000	0.9998950	S
5	8	357.4800	0.0245	5.670	5.000	0.9998950	S
5	9	99.7400	0.0245	5.670	5.000	0.9998950	S
5	10	280.2800	0.0245	5.670	5.000	0.9998950	S
5	10	280.2800	0.0245	5.670	5.000	0.9998950	S
5	12	319.8400	0.0245	5.670	5.000	0.9998950	S
5	12	319.8400	0.0245	5.670	5.000	0.9998950	S
5	12	319.8400	0.0245	5.670	5.000	0.9998950	S
5	12	319.8400	0.0245	5.670	5.000	0.9998950	S
5	12	319.8800	0.0245	5.670	5.000	0.9998950	S
5	22	569.3000	0.0245	5.670	6.000	0.9998950	S
5	22	569.3200	0.0245	5.670	6.000	0.9998950	S
5	22	569.3200	0.0245	5.670	6.000	0.9998950	S
12	5	319.9200	0.0245	5.765	5.000	0.9998950	S
12	5	319.9200	0.0245	5.765	5.000	0.9998950	S
12	38	778.6000	0.0245	5.765	6.000	0.9998950	S
12	38	778.6400	0.0245	5.765	6.000	0.9998950	S
12	38	778.6000	0.0245	5.765	6.000	0.9998950	S
10	5	280.2800	0.0245	5.590	5.000	0.9998950	S
10	40	670.5000	0.0245	5.590	5.170	0.9998950	S
10	40	670.4800	0.0245	5.590	5.170	0.9998950	S
10	40	670.5000	0.0245	5.590	5.170	0.9998950	S
9	22	476.8400	0.0245	5.795	5.000	0.9998950	S
9	72	692.8400	0.0245	5.795	5.830	0.9998950	S
9	73	704.8600	0.0245	5.795	5.700	0.9998950	S
9	73	704.8600	0.0245	5.795	5.700	0.9998950	S
9	73	704.8800	0.0245	5.795	5.700	0.9998950	S
9	78	561.8000	0.0245	5.795	5.000	0.9998950	S
9	78	561.8000	0.0245	5.795	5.000	0.9998950	S
9	78	561.8000	0.0245	5.795	5.000	0.9998950	S
9	5	99.5800	0.0245	5.795	5.000	0.9998950	S
9	5	99.5800	0.0245	5.795	5.000	0.9998950	S
73	9	704.8800	0.0245	5.610	5.500	0.9998950	S
73	9	704.8600	0.0245	5.610	5.500	0.9998950	S
73	72	25.6000	0.0245	5.610	5.000	0.9998950	S
78	9	561.7800	0.0245	5.380	5.500	0.9998950	S
78	22	275.7800	0.0245	5.380	5.000	0.9998950	S
78	22	275.8200	0.0245	5.380	5.000	0.9998950	S
78	22	275.7800	0.0245	5.380	5.000	0.9998950	S
78	123	195.7000	0.0245	5.380	5.000	0.9998950	S
78	123	195.7000	0.0245	5.380	5.000	0.9998950	S
123	22	262.3600	0.0245	5.600	5.000	0.9998950	S
123	22	262.3600	0.0245	5.600	5.000	0.9998950	S
123	78	195.7600	0.0245	5.600	5.000	0.9998950	S
4	142	540.3600	0.0245	5.925	5.000	0.9998950	S

Specpro

4	142	540.3600	0.0245	5.925	5.000	0.9998950	S
142	4	540.4200	0.0245	5.840	5.000	0.9998950	S
142	4	540.4200	0.0245	5.840	5.000	0.9998950	S
142	3	485.7200	0.0245	5.840	5.000	0.9998950	S
3	142	485.7200	0.0245	5.765	5.000	0.9998950	S
3	142	485.7200	0.0245	5.765	5.000	0.9998950	S

Number of Zenith Observations = 51

>From	To	Zenith	StdErr	HI	HT	Flags
5	8	92-39-25.00	14.00	5.670	5.000	
5	8	92-39-27.00	14.00	5.670	5.000	
5	9	96-22-14.00	14.00	5.670	5.000	
5	10	89-48-42.00	14.00	5.670	5.000	
5	10	89-48-41.00	14.00	5.670	5.000	
5	12	87-32-21.00	14.00	5.670	5.000	
5	12	87-32-19.00	14.00	5.670	5.000	
5	12	87-32-18.00	14.00	5.670	5.000	
5	12	87-32-19.00	14.00	5.670	5.000	
5	12	87-32-19.00	14.00	5.670	5.000	
5	22	90-02-42.00	14.00	5.670	6.000	
5	22	90-02-45.00	14.00	5.670	6.000	
5	22	90-02-33.00	14.00	5.670	6.000	
12	5	92-42-23.00	30.00	5.765	5.000	
12	5	92-42-59.00	14.00	5.765	5.000	
12	38	90-09-47.00	14.00	5.765	6.000	
12	38	90-09-47.00	14.00	5.765	6.000	
12	38	90-09-46.00	14.00	5.765	6.000	
10	5	90-26-19.00	14.00	5.590	5.000	
10	40	90-30-07.00	14.00	5.590	5.170	
10	40	90-30-04.00	14.00	5.590	5.170	
10	40	90-30-08.00	14.00	5.590	5.170	
9	22	88-56-14.00	14.00	5.795	5.000	
9	72	91-11-32.00	14.00	5.795	5.830	
9	73	91-05-12.00	14.00	5.795	5.700	
9	73	91-05-16.00	14.00	5.795	5.700	
9	73	91-05-18.00	14.00	5.795	5.700	
9	78	89-30-18.00	14.00	5.795	5.000	
9	78	89-30-16.00	14.00	5.795	5.000	
9	78	89-30-15.00	14.00	5.795	5.000	
9	5	84-28-24.00	14.00	5.795	5.000	
9	5	84-28-25.00	14.00	5.795	5.000	
73	9	88-56-19.00	14.00	5.610	5.500	
73	9	88-56-20.00	14.00	5.610	5.500	
73	72	94-04-53.00	14.00	5.610	5.000	
78	9	90-34-22.00	14.00	5.380	5.500	
78	22	89-16-25.00	14.00	5.380	5.000	
78	22	89-16-20.00	14.00	5.380	5.000	
78	22	89-16-22.00	14.00	5.380	5.000	
78	123	85-16-43.00	14.00	5.380	5.000	
78	123	85-16-43.00	14.00	5.380	5.000	
123	22	92-52-48.00	14.00	5.600	5.000	
123	22	92-52-48.00	14.00	5.600	5.000	
123	78	94-59-56.00	14.00	5.600	5.000	
4	142	88-41-20.00	14.00	5.925	5.000	
4	142	88-41-16.00	14.00	5.925	5.000	
142	4	91-29-18.00	14.00	5.840	5.000	
142	4	91-29-11.00	14.00	5.840	5.000	
142	3	90-40-11.00	14.00	5.840	5.000	
3	142	89-30-23.00	14.00	5.765	5.000	
3	142	89-30-23.00	14.00	5.765	5.000	

Specpro
Number of Sideshots (US Feet) = 102

At	From To	Angle	Distance	Vertical	HI	HT
5	8					
	17	33-03-49.00	878.7000	89-14-05.00	5.670	5.570
	18	13-10-36.00	523.8200	90-28-10.00	5.670	5.570
	19	0-24-32.00	616.4400	89-35-21.00	5.670	5.570
	20	2-23-23.00	766.4600	89-09-32.00	5.670	5.570
	21	18-13-37.00	631.1000	89-25-33.00	5.670	5.570
12	5					
	27	336-02-31.00	70.4000	91-31-21.00	5.765	5.000
	28	333-12-43.00	71.6200	89-23-38.00	5.765	5.000
	29	18-05-01.00	119.9400	92-15-19.00	5.765	5.000
	30	59-52-08.00	137.4400	93-28-42.00	5.765	5.000
	31	61-44-13.00	286.9400	91-42-36.00	5.765	5.000
	32	67-01-55.00	391.8000	91-20-13.00	5.765	5.000
	33	66-24-05.00	393.5600	90-58-56.00	5.765	5.000
	34	69-16-01.00	485.9800	90-57-51.00	5.765	5.000
	35	105-46-09.00	494.8200	90-29-59.00	5.765	6.350
	36	94-48-05.80	626.3140	90-39-28.90	5.765	8.200
	37	94-48-16.80	626.3140	90-39-32.90	5.765	8.400
10	5					
	23	156-20-08.40	543.3810	90-06-05.00	5.590	5.940
	24	183-08-54.70	405.1610	91-34-58.00	5.590	6.160
	25	215-10-54.90	332.6220	93-08-31.90	5.590	5.570
	26	235-38-27.60	358.1490	92-42-22.80	5.590	6.770
	39	250-49-55.40	226.1920	94-39-20.10	5.590	5.760
	45	226-02-30.00	178.8000	96-01-17.00	5.590	6.500
	46	226-02-54.00	178.7800	96-01-13.00	5.590	6.000
40	10					
	16	240-58-09.00	189.3600	93-24-25.00	5.440	7.800
	41	240-58-29.00	189.3400	93-24-24.00	5.440	8.000
	42	286-53-20.10	346.8280	91-41-15.40	5.440	5.900
9	22					
	44	261-34-30.00	185.5400	91-07-37.00	5.795	5.000
	47	261-10-32.00	181.0600	91-56-32.00	5.795	5.000
	48	333-04-08.00	111.1600	94-15-41.00	5.795	7.300
	49	30-07-05.00	180.5800	92-38-39.00	5.795	5.000
	50	30-59-49.00	177.9600	93-30-36.00	5.795	5.000
	51	50-09-34.00	289.8000	91-42-43.00	5.795	5.000
	52	50-11-10.00	286.6800	92-15-00.00	5.795	5.000
	53	16-49-23.00	117.9400	95-46-18.00	5.795	5.000
	54	30-19-30.00	78.2200	97-33-02.00	5.795	5.000
	55	95-14-23.00	60.0800	97-00-27.00	5.795	5.000
	56	95-55-55.00	143.7000	93-52-00.00	5.795	5.000
	57	60-05-02.00	148.5600	93-47-46.00	5.795	5.000
	58	46-25-39.00	211.3600	92-46-57.00	5.795	5.000
	59	58-34-44.00	334.4800	92-04-20.00	5.795	5.000
	60	61-57-10.80	381.8650	91-43-46.90	5.795	6.360
	61	70-04-57.00	307.8800	92-08-43.00	5.795	6.000
	62	87-06-16.00	255.0200	92-45-24.00	5.795	6.000
	63	95-18-13.00	345.5000	92-00-04.00	5.795	6.000
	64	82-34-06.90	365.0650	92-15-03.90	5.795	5.000
	65	71-45-03.00	365.5600	92-06-20.00	5.795	5.000
	66	73-00-27.70	462.1680	91-41-35.80	5.795	5.600
	67	82-00-17.00	438.6400	92-02-31.00	5.795	5.050
	68	90-32-51.40	405.5230	91-57-02.00	5.795	6.300
	69	95-20-26.00	468.1000	92-05-09.00	5.795	6.300
	70	95-20-28.00	468.1000	92-05-05.00	5.795	6.800
	71	85-50-16.70	633.7330	91-19-58.90	5.795	6.100
	76	356-50-00.00	248.3600	90-57-19.00	5.795	5.000
	77	356-33-59.00	251.0400	91-30-12.00	5.795	5.000
73	9					

Specpro

	85	60-06-43.00	24.7800	89-58-37.00	5.610	5.000
	86	58-41-34.00	28.2800	94-55-46.00	5.610	5.000
	88	347-55-46.70	325.9740	89-59-51.00	5.610	6.400
	89	334-39-34.00	320.2400	90-36-13.00	5.610	5.000
	90	334-39-40.00	320.2800	90-36-17.00	5.610	5.200
	91	350-44-37.00	453.1800	90-06-00.00	5.610	5.000
	92	344-25-03.00	415.1000	90-09-51.00	5.610	5.000
	93	343-24-21.00	370.4800	89-58-46.00	5.610	5.870
	94	229-46-54.00	141.1800	92-31-18.00	5.610	6.000
	95	229-47-11.00	141.1400	92-31-19.00	5.610	6.500
	96	196-59-51.00	231.8800	91-48-34.00	5.610	5.000
	97	196-59-59.00	231.8800	91-48-29.00	5.610	5.800
78	9					
	102	342-45-19.00	246.1200	91-41-43.00	5.380	5.000
	103	342-13-16.00	247.7600	92-17-15.00	5.380	5.000
	104	60-32-10.00	216.9600	91-30-56.00	5.380	5.000
	105	59-55-38.00	216.4400	92-13-38.00	5.380	5.000
	106	67-37-15.50	248.8450	92-16-56.20	5.380	5.200
	107	66-33-49.00	264.2000	92-33-02.00	5.380	6.850
	108	66-35-24.00	264.3400	92-34-07.00	5.380	6.500
	109	40-21-22.00	379.5200	91-29-44.00	5.380	8.500
	110	39-03-41.80	378.7840	91-31-37.80	5.380	10.300
	111	38-38-55.60	378.8510	91-31-33.80	5.380	10.700
	112	18-29-51.00	225.4000	92-53-48.00	5.380	5.000
	113	352-59-01.00	234.1200	92-27-45.00	5.380	5.000
	114	358-10-15.00	178.9000	93-00-17.00	5.380	5.000
	116	57-38-48.00	181.8000	92-25-45.00	5.380	5.000
	117	94-56-36.50	250.6480	91-43-44.80	5.380	7.500
	120	81-42-07.00	94.0600	91-40-25.00	5.380	4.950
	121	307-50-43.00	100.8800	90-57-19.00	5.380	5.000
	122	308-36-24.00	192.3800	90-23-07.00	5.380	5.000
	125	215-17-28.00	83.3000	84-49-23.00	5.380	5.000
123	22					
	129	120-40-15.00	344.1000	92-45-02.00	5.600	7.000
	130	120-40-05.00	344.0600	92-45-10.00	5.600	7.000
	131	131-26-07.00	322.3000	92-34-16.00	5.600	7.000
	132	113-16-15.00	228.4800	92-51-24.00	5.600	5.000
	133	131-24-52.00	197.1800	92-21-57.00	5.600	5.000
	134	159-16-25.00	93.7000	92-56-21.00	5.600	5.000
	135	206-33-06.00	153.8800	90-20-43.00	5.600	5.000
	136	213-52-31.00	221.4600	88-24-58.00	5.600	5.000
	137	213-38-14.00	217.5800	89-11-47.00	5.600	5.000
	138	281-13-51.00	169.3200	89-45-16.00	5.600	5.000
	139	56-51-36.00	597.9600	91-27-56.00	5.600	21.700
	140	56-51-32.00	597.9600	91-27-54.00	5.600	22.700
	141	47-45-18.00	643.3800	92-40-25.00	5.600	5.630
4	142					
	145	284-13-17.00	108.1000	96-48-17.00	5.925	6.000
	146	284-13-47.00	108.1000	96-48-17.00	5.925	5.200
3	142					
	152	158-46-01.00	116.7400	93-26-58.00	5.765	8.500
	153	158-45-11.00	116.7400	93-27-29.00	5.765	8.000
0						

Adjustment Results

Solution Has Converged in 4 Iterations

Adjusted Coordinates (US Feet)

Station	N	E	Elev	Description
1	551472.4620	2357923.3260	1023.9200	GPS RAV-1

Specpro

2	558490.7870	2357792.6680	1061.6100	GPS RAV-2
3	558751.5290	2353456.8130	1071.8620	GPSPK N OF LL11
4	558800.3390	2352434.5520	1063.5340	GPSPK S CREEK
5	560144.9580	2354866.1340	1055.3610	GPSNS RR BOX
8	560493.8987	2354941.8337	1039.4680	GPS IR VALLEY
6	559835.0760	2356591.0510	1020.1090	GPSNS ISLAND
22	560706.3740	2354960.3950	1054.5910	GPSNS F POST
7	559837.0000	2356571.0000	1019.8000	DA2-102 TOP
13	559837.0000	2356571.0000	1019.6000	DA2-102 BOT
11	559895.6540	2356890.9960	1018.5690	GPSNS N SHORE
14	559883.0000	2356891.0000	1018.0000	DA2-103 TOP
15	559883.0000	2356891.0000	1017.5000	DA2-103 BOT
142	558809.6449	2352974.6491	1076.7744	PK OPP SIGN
9	560231.9759	2354913.5987	1044.9725	NS HILLSIDE
10	559995.4787	2354629.0808	1056.9408	NS OPP CLUMP
12	559829.6033	2354814.6998	1069.7632	NS OPP POP
38	559844.8054	2355593.0798	1067.3136	NS CIRCLE
40	560048.6015	2353960.7916	1051.4892	HOMEMADE TRAV
72	560182.5962	2355604.4491	1030.5242	DISK DA2MW 108
73	560159.1336	2355614.4942	1031.7356	NS NEAR MW 108
78	560746.2135	2354687.5467	1050.6952	NS IN FIELD
123	560909.2150	2354794.5799	1067.1729	NS NEAR RIDGE

Statistical Summary

Number of Stations = 15

Number of Observations = 136
Number of Unknowns = 30
Number of Redundant Obs = 106

Observation	Count	Sum Squares of StdRes	Error Factor
Angles	34	28.93	1.04
Distances	51	16.11	0.64
Zeniths	51	47.05	1.09
Total	136	92.09	0.93

Adjustment Passes the Chi Square Test at 5% Level

Adjusted Observations and Residuals

Adjusted Angle Observations

At	From	To	Angle	Residual	StdErr	StdRes
5	8	9	16-22-13.90	-0-00-07.60	26.97	0.3
5	8	10	225-31-31.50	-0-00-06.50	16.11	0.4
5	8	10	225-31-31.50	0-00-06.50	16.11	0.4
5	8	12	177-01-23.50	0-00-00.50	15.80	0.0
5	8	12	177-01-23.50	-0-00-00.50	15.80	0.0
5	8	12	177-01-23.50	-0-00-02.00	15.80	0.1
5	8	12	177-01-23.50	0-00-00.50	15.80	0.0
5	8	12	177-01-23.50	0-00-01.50	15.80	0.1
5	8	22	357-17-26.99	0-00-30.99	8.73	3.6*
5	8	22	357-17-26.99	0-00-19.49	8.73	2.2
5	8	22	357-17-26.99	0-00-18.99	8.73	2.2
12	5	38	79-37-04.00	-0-00-00.00	10.78	0.0
12	5	38	79-37-04.00	-0-00-02.00	10.78	0.2
12	5	38	79-37-04.00	0-00-02.00	10.78	0.2

			Specpro			
10	5	40	216-46-45.67	-0-00-02.33	13.73	0.2
10	5	40	216-46-45.67	-0-00-00.33	13.73	0.0
10	5	40	216-46-45.67	0-00-02.67	13.73	0.2
9	22	72	88-27-17.02	-0-00-03.98	8.92	0.4
9	22	73	90-17-58.83	-0-00-03.17	8.93	0.4
9	22	73	90-17-58.83	-0-00-03.17	8.93	0.4
9	22	73	90-17-58.83	0-00-10.33	8.93	1.2
9	22	78	330-38-12.21	-0-00-02.79	7.86	0.4
9	22	78	330-38-12.21	-0-00-07.79	7.86	1.0
9	22	78	330-38-12.21	0-00-02.21	7.86	0.3
9	22	5	202-58-37.41	0-00-08.41	33.08	0.3
9	22	5	202-58-37.41	-0-00-12.59	33.08	0.4
73	9	72	60-53-21.74	-0-00-00.26	113.51	0.0
78	9	22	302-02-12.86	-0-00-05.14	11.61	0.4
78	9	22	302-02-12.86	-0-00-08.14	11.61	0.7
78	9	22	302-02-12.86	-0-00-05.14	11.61	0.4
78	9	123	237-01-12.47	-0-00-07.53	17.83	0.4
78	9	123	237-01-12.47	0-00-12.97	17.83	0.7
123	22	78	72-33-18.84	-0-00-20.16	17.97	1.1
142	4	3	187-51-35.67	-0-00-00.83	11.15	0.1

Adjusted Distance Observations (US Feet)

From	To	Distance	Residual	StdErr	StdRes
5	8	357.4789	-0.0011	0.0245	0.0
5	8	357.4789	-0.0011	0.0245	0.0
5	9	99.7465	0.0065	0.0245	0.3
5	10	280.2778	-0.0022	0.0245	0.1
5	10	280.2778	-0.0022	0.0245	0.1
5	12	319.8501	0.0101	0.0245	0.4
5	12	319.8501	0.0101	0.0245	0.4
5	12	319.8501	0.0101	0.0245	0.4
5	12	319.8501	0.0101	0.0245	0.4
5	12	319.8501	-0.0299	0.0245	1.2
5	22	569.3341	0.0341	0.0245	1.4
5	22	569.3341	0.0141	0.0245	0.6
5	22	569.3341	0.0141	0.0245	0.6
12	5	319.9149	-0.0051	0.0245	0.2
12	5	319.9149	-0.0051	0.0245	0.2
12	38	778.6133	0.0133	0.0245	0.5
12	38	778.6133	-0.0267	0.0245	1.1
12	38	778.6133	0.0133	0.0245	0.5
10	5	280.2847	0.0047	0.0245	0.2
10	40	670.4933	-0.0067	0.0245	0.3
10	40	670.4933	0.0133	0.0245	0.5
10	40	670.4933	-0.0067	0.0245	0.3
9	22	476.8323	-0.0077	0.0245	0.3
9	72	692.8355	-0.0045	0.0245	0.2
9	73	704.8705	0.0105	0.0245	0.4
9	73	704.8705	0.0105	0.0245	0.4
9	73	704.8705	-0.0095	0.0245	0.4
9	78	561.8100	0.0100	0.0245	0.4
9	78	561.8100	0.0100	0.0245	0.4
9	78	561.8100	0.0100	0.0245	0.4
9	5	99.5947	0.0147	0.0245	0.6
9	5	99.5947	0.0147	0.0245	0.6
73	9	704.8666	-0.0134	0.0245	0.5
73	9	704.8666	0.0066	0.0245	0.3
73	72	25.5901	-0.0099	0.0245	0.4
78	9	561.8163	0.0363	0.0245	1.5
78	22	275.7929	0.0129	0.0245	0.5
78	22	275.7929	-0.0271	0.0245	1.1
78	22	275.7929	0.0129	0.0245	0.5

		Specpro			
78	123	195.6852	-0.0148	0.0245	0.6
78	123	195.6852	-0.0148	0.0245	0.6
123	22	262.3496	-0.0104	0.0245	0.4
123	22	262.3496	-0.0104	0.0245	0.4
123	78	195.7682	0.0082	0.0245	0.3
4	142	540.3743	0.0143	0.0245	0.6
4	142	540.3743	0.0143	0.0245	0.6
142	4	540.4174	-0.0026	0.0245	0.1
142	4	540.4174	-0.0026	0.0245	0.1
142	3	485.7387	0.0187	0.0245	0.8
3	142	485.7224	0.0024	0.0245	0.1
3	142	485.7224	0.0024	0.0245	0.1

Adjusted Zenith Observations

From	To	Zenith	Residual	StdErr	StdRes
5	8	92-39-20.25	-0-00-04.75	14.00	0.3
5	8	92-39-20.25	-0-00-06.75	14.00	0.5
5	9	96-21-54.80	-0-00-19.20	14.00	1.4
5	10	89-48-50.42	0-00-08.42	14.00	0.6
5	10	89-48-50.42	0-00-09.42	14.00	0.7
5	12	87-32-21.66	0-00-00.66	14.00	0.0
5	12	87-32-21.66	0-00-02.66	14.00	0.2
5	12	87-32-21.66	0-00-03.66	14.00	0.3
5	12	87-32-21.66	0-00-02.66	14.00	0.2
5	12	87-32-21.66	0-00-02.66	14.00	0.2
5	22	90-02-39.41	-0-00-02.59	14.00	0.2
5	22	90-02-39.41	-0-00-05.59	14.00	0.4
5	22	90-02-39.41	0-00-06.41	14.00	0.5
12	5	92-43-02.70	0-00-39.70	30.00	1.3
12	5	92-43-02.70	0-00-03.70	14.00	0.3
12	38	90-09-46.67	-0-00-00.33	14.00	0.0
12	38	90-09-46.67	-0-00-00.33	14.00	0.0
12	38	90-09-46.67	0-00-00.67	14.00	0.0
10	5	90-26-36.83	0-00-17.83	14.00	1.3
10	40	90-30-06.33	-0-00-00.67	14.00	0.0
10	40	90-30-06.33	0-00-02.33	14.00	0.2
10	40	90-30-06.33	-0-00-01.67	14.00	0.1
9	22	88-56-22.99	0-00-08.99	14.00	0.6
9	72	91-11-31.31	-0-00-00.69	14.00	0.0
9	73	91-05-01.53	-0-00-10.47	14.00	0.7
9	73	91-05-01.53	-0-00-14.47	14.00	1.0
9	73	91-05-01.53	-0-00-16.47	14.00	1.2
9	78	89-29-50.80	-0-00-27.20	14.00	1.9
9	78	89-29-50.80	-0-00-25.20	14.00	1.8
9	78	89-29-50.80	-0-00-24.20	14.00	1.7
9	5	84-28-20.68	-0-00-03.32	14.00	0.2
9	5	84-28-20.68	-0-00-04.32	14.00	0.3
73	9	88-55-58.45	-0-00-20.55	14.00	1.5
73	9	88-55-58.45	-0-00-21.55	14.00	1.5
73	72	94-04-53.06	0-00-00.06	14.00	0.0
78	9	90-34-17.01	-0-00-04.99	14.00	0.4
78	22	89-16-10.50	-0-00-14.50	14.00	1.0
78	22	89-16-10.50	-0-00-09.50	14.00	0.7
78	22	89-16-10.50	-0-00-11.50	14.00	0.8
78	123	85-16-52.85	0-00-09.85	14.00	0.7
78	123	85-16-52.85	0-00-09.85	14.00	0.7
123	22	92-52-48.25	0-00-00.25	14.00	0.0
123	22	92-52-48.25	0-00-00.25	14.00	0.0
123	78	95-00-16.20	0-00-20.20	14.00	1.4
4	142	88-41-38.72	0-00-18.72	14.00	1.3
4	142	88-41-38.72	0-00-22.72	14.00	1.6
142	4	91-29-34.77	0-00-16.77	14.00	1.2

Specpro

142	4	91-29-34.77	0-00-23.77	14.00	1.7
142	3	90-40-42.76	0-00-31.76	14.00	2.3
3	142	89-30-38.77	0-00-15.77	14.00	1.1
3	142	89-30-38.77	0-00-15.77	14.00	1.1

Adjusted Bearings and Horizontal Distances (US Feet)

>From	To	Bearing	Distance
4	142	N89-00-46.38E	540.1773
5	8	N12-14-24.57E	357.0575
5	9	N28-36-38.47E	99.1212
5	10	S57-45-56.07W	280.2468
5	12	S09-15-48.07W	319.5216
5	22	N09-31-51.56E	569.2742
9	22	N05-38-01.06E	476.7006
9	72	S85-54-41.92E	692.6128
9	73	S84-04-00.11E	704.6704
9	78	N23-43-46.74W	561.7294
10	40	N85-27-18.26W	670.3972
12	38	N88-52-52.07E	778.5284
73	72	N23-10-38.38W	25.5225
78	22	S81-41-33.88E	275.7415
78	123	N33-17-25.73E	195.0014
123	22	S39-15-53.10E	261.9907
142	3	S83-07-37.95E	485.6537

Sideshot Coordinates Computed After Adjustment

Station	N	E	Elev	Description
17	560762.8698	2355490.6329	1067.1971	DA2-083
18	560618.0115	2355090.9266	1051.1692	DA2-086
19	560746.3582	2355001.1035	1059.8811	DA2-084
20	560886.4097	2355059.6807	1066.7123	DA2-092
21	560688.8316	2355186.0795	1061.7852	DA2-085
27	559897.6694	2354796.8497	1068.6577	DA2MW-109GND
28	559897.8883	2354793.1373	1071.2858	DA2MW-109
29	559936.0453	2354869.7491	1065.8083	DA2-058
30	559878.4658	2354942.8744	1062.1896	DA2-059
31	559922.9690	2355085.8581	1061.9657	DA2-060
32	559922.3927	2355195.2015	1061.3867	DA2MW-110GND
33	559927.0224	2355195.9097	1063.7817	DA2MW-110
34	559926.2165	2355290.8573	1062.3506	DA2-061
35	559620.2588	2355262.9761	1064.8625	DA2-057
36	559677.4213	2355422.1335	1060.1353	DA2-100 TOP
37	559677.3890	2355422.1253	1059.9231	DA2-100 BOT
23	559545.5810	2354324.4629	1055.6293	DA2-056
24	559798.6175	2354275.1861	1045.1798	DA2-055
25	560012.5548	2354297.4331	1038.7284	DA2-050
26	560137.5809	2354300.8053	1038.8502	DA2-051
39	560136.1076	2354452.9031	1038.4118	DA2-052
45	560037.9105	2354456.4235	1037.2748	DA2-091 BOT
46	560037.9259	2354456.4474	1037.7803	DA2-091 TOP
16	560220.6084	2353882.4547	1037.8760	DA2-096 TOP
41	560220.5979	2353882.4796	1037.6781	DA2-096 BOT
42	560371.2690	2354087.4636	1040.8150	DA2-049
44	560222.9429	2354728.3342	1042.1184	DA2MW-111
47	560221.9046	2354732.9423	1039.6311	DA2MW-111 GND
48	560335.2473	2354873.3401	1035.2076	DA2-054
49	560378.3554	2355018.9834	1037.4368	DA2MW-112
50	560374.5058	2355019.5688	1034.8723	DA2MW-112 GND

Specpro

51	560394.8068	2355153.1349	1037.1099	DA2MW-113
52	560392.8912	2355150.5540	1034.5125	DA2MW-113 GND
53	560340.4084	2354958.4169	1033.9070	DA2-077
54	560294.7348	2354959.1266	1035.4894	DA2-072
55	560220.7283	2354972.1532	1038.4378	DA2-067
56	560203.2342	2355054.0458	1036.0771	DA2-068
57	560292.9286	2355048.7042	1035.9319	DA2-073
58	560361.7575	2355080.0774	1035.5071	DA2-078
59	560377.3757	2355214.5406	1033.6730	DA2-079
60	560377.4941	2355266.4186	1032.8812	DA2-080
61	560307.8767	2355211.7203	1033.2425	DA2-074
62	560219.8089	2355168.0061	1032.5025	DA2-069
63	560166.4698	2355252.5805	1032.7031	DA2-065
64	560243.4187	2355278.1642	1031.4283	DA2-070
65	560311.7548	2355270.0549	1032.3366	DA2-075
66	560322.9507	2355366.4691	1031.5109	DA2-081
67	560250.0375	2355351.5419	1030.0883	DA2-076
68	560188.3415	2355316.4882	1030.6647	DA2-071
69	560142.9336	2355372.7859	1027.4303	DA2-099 TOP
70	560142.9291	2355372.7854	1026.9393	DA2-099 BOT
71	560215.7068	2355546.8848	1029.9246	DA2-082
76	560480.0451	2354924.2864	1041.6269	DA2MW-107
77	560482.7181	2354923.2314	1039.1815	DA2MW-107 GND
85	560181.7768	2355604.4342	1032.3556	DA2MW-108
86	560184.5883	2355602.4216	1029.9155	DA2MW-108 GND
88	560124.2883	2355290.4223	1030.9598	DA2-066
89	560052.7412	2355312.4985	1028.9719	DA2-089 TOP
90	560052.7367	2355312.4577	1028.7653	DA2-089 BOT
91	560132.8672	2355162.1243	1031.5546	DA2-064
92	560089.5641	2355205.3114	1031.1562	DA2-062
93	560090.6037	2355250.4471	1031.6085	DA2-063
94	560042.6095	2355693.9369	1025.1341	DA2-090 TOP
95	560042.6360	2355693.9048	1024.6351	DA2-090 BOT
96	560068.8433	2355827.9212	1025.0239	DA2-101 TOP
97	560068.8349	2355827.9178	1024.2295	DA2-101 BOT
102	560560.4931	2354848.8453	1043.7941	DA2MW-106
103	560560.8441	2354851.5970	1041.1862	DA2MW-106 GND
104	560572.5805	2354557.6221	1045.3370	DA2MW-105
105	560571.6999	2354559.8334	1042.6638	DA2MW-105 GND
106	560567.0429	2354515.1793	1040.9656	DA2-040
107	560552.6808	2354508.1202	1037.4681	DA2-088 BOT
108	560552.6637	2354507.9385	1037.7287	DA2-088 TOP
109	560382.7231	2354579.0027	1037.6700	DA2-043
110	560381.0785	2354587.4381	1035.6803	DA2-087 TOP
111	560380.3018	2354590.0543	1035.2859	DA2-087 BOT
112	560522.0630	2354708.0728	1039.6847	DA2-047
113	560545.2080	2354807.1137	1041.0162	DA2-048
114	560585.0590	2354764.6167	1041.6976	DA2-045
116	560595.4988	2354586.2056	1043.3698	DA2-044
117	560665.5408	2354450.3845	1041.0122	DA2-037
120	560696.3573	2354607.8458	1048.3781	DA2-041
121	560721.6170	2354785.3568	1049.3934	DA2-042
122	560696.8272	2354873.4543	1049.7816	DA2-046
125	560827.4820	2354704.1718	1058.5916	DA2-039
129	560857.8606	2354454.7710	1049.2603	DA2-097 TOP
130	560857.8502	2354454.8136	1049.2489	DA2-097 BOT
131	560921.4081	2354472.8691	1051.3147	DA2-034
132	560846.3455	2354575.2401	1056.3860	DA2-038
133	560916.6042	2354597.7273	1059.6333	DA2-035
134	560956.0110	2354713.5558	1062.9684	DA2-036
135	561059.3040	2354760.7198	1066.8456	DA2-114
136	561129.5886	2354773.7893	1073.8942	DA2MW-104
137	561125.7023	2354773.2481	1070.8245	DA2MW-104 GND
138	560988.7853	2354944.0164	1068.4985	DA2-093

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139	560339.4764	2354613.9001	1035.7795	DA2-098 TOP
140	560339.4727	2354613.9112	1034.7853	DA2-098 BOT
141	560273.6452	2354699.7039	1037.1315	DA2-053
145	558904.8159	2352459.1228	1050.6507	DA2-095 BOT
146	558904.8123	2352459.1380	1051.4507	DA2-095 TOP
152	558780.4271	2353569.6888	1062.1030	DA2-094 BOT
153	558780.4542	2353569.6807	1062.5855	DA2-094 TOP

Elapsed Time = 00:00:01

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0000011E Summary of Files Used and Option Settings
0000083C Adjustment Solution Iterations
00001886 Summary of Unadjusted Input Observations
00006567 Adjusted Coordinates
00006C48 Statistical Summary
00006F45 Adjusted Observations and Residuals
00009A4F Adjusted Bearings and Horizontal Distances
00009E73 Sideshot Coordinates Computed After Adjustment
0000BA76
STARPLUS
0003BEFB