

APPENDIX D
FIELD SURVEY DATA AND METHODS

GEONEX ITECH

I. INTRODUCTION

This report details survey work completed by Geonex Itech, Inc. (Itech) for Ebasco Environmental Services at Tooele South Depot, Utah. The survey was accomplished using conventional methods.

The survey conducted by Geonex Itech, Inc. included:

- Reconnaissance: 6 control stations
- Monumentation: 9 primary monuments
3 secondary monuments
- References: 3 reference points were established at primary monuments where possible

The horizontal specifications were for Third Order, Class I (1:10,000). Vertical specifications were Third Order for the SWMU primary monuments and wells. Geonex Itech provided three personnel, all equipment and software during the field phase of the project. Itech also was responsible for preparing the final adjustments and this report.

This report details the personnel and equipment used on the project followed by a section on operations and methods. All pertinent adjustment closures and coordinate listings, and daily logs are included in the attached Appendices.

II. PERSONNEL AND EQUIPMENT

A. Personnel

Itech supplied three personnel during the field operation:

Scott Cashin	Project Manager, Party Chief
James Scherf	Instrument Man
Richard Howard	Instrument Man, Rodman

As field project manager, Mr. Cashin was the responsible person in charge. He reviewed the daily work plans and was in direct charge of all the field computations.

Additional Itech personnel were involved in other areas of the project:

Frank Drexel	Project logistical support
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B. Equipment

Itech supplied all equipment, vehicles, computers, printers, software and office products. This included:

- 2 - HP 3820A Total Stations
- 4 - Motorola HT-440 handheld VHF radios
- 1 - HP 9816 Computer
- 1 - MX-80 printer
- 2 - 4x4 Vehicles
- 1 - Wild NA-2 level with rod
- Misc - Optical Tribrachs, Tripods, Batteries, Chargers

Software:

PACSOFT COGO: Traverse adjustment and coordinate geometry

COGO: In-house program for coordinate geometry

Misc: Utility programs for abstracting, traverse loop closures, editing data, and coordinate conversion

III. OPERATIONS AND METHODS

Field operations began on August 5, 1990. Personnel attended site orientation, where they received their base passes and were fitted for gas masks. Blood tests, review of the site health and safety plan and tour of SWMU sites and wells were completed prior to commencement of work.

Surveys began with reconnaissance of horizontal and vertical control. Horizontal and vertical control recovery and planning horizontal and vertical traverses were done concurrently.

Horizontal Control

After reconnaissance was completed, horizontal and vertical control traverses commenced. Horizontal control was conducted by electronic traverse methods utilizing the HP 3820a total station (EDM and theodolite). Two sets of direct and reversed horizontal angles were observed at each traverse station with horizon closures calculated in the field. Two sets of distances and zenith angles were obtained with each line reobserved at the following station. Twelve horizontal traverse control points were set on post and seven control points were set off post. All SWMU monuments and main control points were located from side ties from at least two control traverse points. USGS stations AJAX, BILL, and MORGAN were used as primary horizontal control.

Traverse computations were performed at the Denver office utilizing the HP 9816 computer with Pacsoft survey software, and adjusted by the compass rule method. Final NAD 1927 Utah Central Zone State Plane and UTM coordinates were prepared.

Vertical Control

Vertical control was conducted by differential leveling methods utilizing the Wild NA2 automatic level. Leveling operations began with peg test of the automatic level prior to running level circuits. All vertical traverses were surveyed using three wire leveling techniques to ensure that project specifications would be met. Twenty-seven temporary bench marks (TBM's) were set at various points throughout the project. Level circuits were adjusted by dividing the closing error by the number of turns and apportioning the difference evenly throughout the circuit. NGS bench marks AJAX and X-175 were used as primary vertical control.

As noted on the final coordinate listings included as Appendix III, a datum shift of approximately 0.5 feet exists for elevations at NGS bench marks. This datum shift is identified by comparing the elevations of common bench marks shown in separate NGS publications. Essentially this shift is between the old adjusted datum from leveling completed in the early 1900's and the new unadjusted datum from leveling in 1970. One datum is not necessarily more correct than the other, however it will be in your best interest to chose the datum that has been in use for this site. This can be determined

either by examining the reports for previous surveys for the bench mark designation, elevation, and stated datum used to initiate leveling, or by releveling some of the old well locations. As also noted on the listings, we leveled through an unspecified bench mark on site. We found that the stamped elevation agreed closely with the old datum, however it is not known if this is indicative of the datum used for previous survey locations. Each datum is based on NGVD 1929.

Two listings are provided, with each listing showing the elevations in each datum.

SWMU Sites

Thirteen (13) SWMU sites were surveyed. At all except three SWMU sites, the primary monument established consists of a 3' x 5/8" rebar with 3-1/4" aluminum cap set in 5" of concrete. At the remaining three SWMU sites, monuments established consisted of a 2' x 5/8" rebar with 1-1/2" aluminum cap. A minimum of three reference points were also set for future reestablishment of the monument, where possible. References were not established where danger of unexploded ordinances exist. Horizontal positions were located from side ties from at least two control traverse points. Elevations were determined by differential leveling methods.

Well Locations

Forty-one (41) monitoring wells and three (3) piezometers were located in conjunction with the ground control. Horizontal locations were obtained from single side ties from two nearby traverse stations. Each side tie consisted of two sets of direct and reverse horizontal angles, with horizon closures calculated in the field, and zenith angles and distances obtained in both direct and reverse positions. Elevations were provided by differential leveling methods in conjunction with the circuits run for the ground control. Elevations were established at top of steel casing (where applicable), the notch on the PVC pipe, and at ground level at the base of the wells.

APPENDIX I

Control Traverse Closures

TOOELE ARMY DEPOT (SOUTH AREA), UTAH
 SURVEYED FOR EBASCO SERVICES, INC.
 SURVEYED BY: GEONEX ITECH, INC.
 DATE: AUGUST, 1990
 JOB NUMBER: 590017-001

CONTROL TRAVERSE CLOSURES

TRAVERSE	INITIAL STATION	CLOSING STATION	LENGTH	CLOSURE
1	MORGAN	AJAX	49,532	35,418
2	AJAX	CP-7	60,408	81,187
3	CP-15	CP-16	9,313	88,785

LEVEL CIRCUIT CLOSURES

CIRCUIT	INITIAL BENCH MARK	CLOSING BENCH MARK	NUMBER OF TURNS	MISCLOSURE
A	X-175	AJAX	184	0.022'
B	TBM A-19	TBM A-4	97	0.027'
C	TBM A-3	TBM A-4	9	0.021'
D	TBM A-8	TBM A-9	5	0.000'
E	CP-9	TBM A-20	20	0.001'
F	TBM A-22	TBM A-23	2	0.000'
G	TBM A-13	TBM A-12	6	0.000'
H	TBM A-17	TBM A-18	5	0.010'
I	CP-13	TBM A-14	77	0.111'

APPENDIX II Known Control

TOOELE ARMY DEPOT (SOUTH AREA), UTAH
 SURVEYED FOR EBASCO SERVICES, INC.
 SURVEYED BY: GEONEX ITECH, INC.
 DATE: AUGUST, 1990
 JOB NUMBER: 590017-001

KNOWN CONTROL

HORIZONTAL CONTROL
 NAD 1927, UTAH CENTRAL ZONE STATE PLANE COORDINATES

STATION	NORTHING-Y	EASTING-X	ELEV/FEET	LATITUDE	LONGITUDE	HISTORY
0001 AJAX	704623.537	1750091.422	5061.584	40 15 52.01609	112 23 43.915430	USGS 1955
0002 BILL	758043.760	1752800.999	4987.1	40 24 40.18479	112 23 15.802610	USGS 1955
0003 MORGAN	752575.197	1740485.983	5302.3	40 23 44.90763	112 25 54.264150	USGS 1955

VERTICAL CONTROL
 NGVD 1929

BENCH MARK	ELEVATION 1984 (UNADJ) L-22149	ELEVATION 1974 (ADJ) QUAD 401122	ELEVATION DIFFERENCE	USE FOR PROJECT	HISTORY
AJAX (USGS)	5061.584			CIRCUIT CONTROL	CGS 1970
X-175	5030.132			CIRCUIT CONTROL	CGS 1970
A 62	5021.464	5020.948	0.516	DATUM COMPARISON	CGS 1970; CGS 1934
X 2	5062.835	5062.349	0.486	DATUM COMPARISON	CGS 1970; CGS 1908

LEVEL CHECKS TO ON-SITE BENCH MARK

BENCH MARK	DATUM	ELEVATION LEVELED	ELEVATION STAMPED	ELEVATION DIFFERENCE
NO 416-USA	1974 (ADJ) QUAD 401122	5107.18	5107.19	-0.01
NO 416-USA	1984 (UNADJ) L-22149	5107.68	5107.19	+0.49

APPENDIX III State Plane Coordinate Listing

TOOELE ARMY DEPOT (SOUTH AREA), UTAH
 SURVEYED FOR EBASCO SERVICES, INC.
 SURVEYED BY: GEONEX ITECH, INC.
 DATE: AUGUST, 1990
 JOB NUMBER: 590017-001

MAD 1927, UTAH CENTRAL ZONE STATE PLANE COORDINATES (ZONE 4302)
 MAD 1927, UNIVERSAL TRANSVERSE MERCATOR (UTM) ZONE 12 COORDINATES
 NGVD 1929 ELEVATIONS (BASED ON NGS ADJUSTED ELEVATIONS - 1974)

STATION	UTAH CENTRAL ZONE STATE PLANE COORDINATES (FEET)		UTM ZONE 12 COORDS (METERS)		ELEV MONUMENT (FEET)	ELEV T.O.C (FEET)	ELEV PVC (FEET)	ELEV GROUND (FEET)	DESCRIPTION
	NORTHING Y	EASTING X	NORTHING	EASTING					
101	722982.7	1773280.1	4463387.0	388432.2		5326.23	5326.03	5324.4	S-32-90
102	722673.4	1772776.5	4463293.7	388278.2		5314.24	5313.94	5311.9	S-33-90
103	722479.3	1773430.7	4463233.4	388477.2		5316.11	5315.79	5313.9	S-34-90
104	722299.0	1777552.7	4463171.2	389733.1		5369.79	5369.57	5367.6	S-35-90
105	722180.4	1774270.7	4463140.8	388732.7		5310.07	5309.74	5307.9	S-36-90
106	721977.0	1775053.5	4463077.5	388970.9		5309.07	5308.78	5306.9	S-37-90
107	721721.5	1775951.1	4462998.0	389244.0		5319.49	5319.17	5317.4	S-38-90
108	721431.9	1776961.7	4462908.0	389551.4		5333.28	5332.98	5331.3	S-39-90
109	721054.2	1778271.6	4462790.6	389950.0		5350.96	5350.67	5349.0	S-40-90
110	720807.6	1779095.0	4462714.0	390200.5		5378.42	5378.13	5376.1	S-41-90
111	716944.1	1771794.7	4461549.4	387969.0		5191.91	5191.61	5189.5	S-42-90
112	716777.2	1771531.9	4461499.0	387888.6		5187.22	5186.89	5185.0	S-43-90
113	716551.2	1771625.3	4461430.0	387916.7		5183.12	5182.80	5181.1	S-44-90
114	722103.9	1753905.6	4463153.1	382526.4		5049.07	5048.82	5047.0	S-45-90
115	716852.0	1755630.9	4461549.6	383043.0		5048.02	5047.74	5045.6	S-46-90
116	716373.5	1762994.1	4461390.9	385286.1		5146.62	5146.35	5144.3	S-47-90
117	716009.5	1762545.5	4461280.8	385148.7		5138.23	5137.92	5136.3	S-48-90
118	715908.9	1762679.1	4461249.9	385189.3		5140.46	5140.13	5138.5	S-49-90
119	713629.2	1770871.0	4460540.9	387681.7		5152.87	5152.59	5150.8	S-50-90
120	713440.2	1770606.9	4460483.7	387600.9		5147.98	5147.68	5146.1	S-51-90
121	713292.4	1770822.6	4460438.3	387666.4		5149.79	5149.49	5147.6	S-53-90
122	712853.8	1758818.3	4460325.6	384007.4		5050.42	5050.13	5048.4	S-54-90
123	712531.7	1758717.8	4460227.6	383976.2		5042.12	5041.90	5040.3	S-55-90
124	712272.1	1758765.4	4460148.4	383990.3		5052.54	5052.19	5049.8	S-56-90
125	711388.2	1758991.4	4459878.7	384057.6		5037.73	5037.44	5035.1	S-57-90
126	711933.6	1757580.3	4460047.3	383628.5		5036.35	5036.03	5034.2	S-58-90
127	711689.0	1757670.1	4459972.6	383655.4		5035.64	5035.22	5033.5	S-59-90
128	711414.4	1757770.9	4459888.8	383685.7		5034.77	5034.41	5032.8	S-60-90
129	707786.5	1776938.8	4458749.7	389520.6		5122.74	5122.44	5120.4	S-61-90
130	707268.7	1776834.7	4458592.1	389488.0		5117.79	5117.49	5115.1	S-62-90
131	707213.4	1776945.8	4458575.1	389521.8		5118.22	5117.95	5116.1	S-63-90
132	708445.0	1761410.8	4458977.5	384789.7		5045.26	5044.95	5042.2	S-64-90
133	705659.9	1761393.9	4458128.8	384779.7		5037.99	5037.67	5034.9	S-65-90
134	708126.9	1764119.5	4458875.9	385614.6		5058.66	5058.36	5055.7	S-66-90
135	703444.4	1760522.9	4457455.2	384510.4		5038.64	5038.36	5036.4	S-67-90
136	703634.0	1765856.2	4457503.6	386136.0		5058.99	5058.72	5056.7	S-68-90
137	706841.1	1770267.6	4458473.3	387486.0		5104.25	5103.92	5101.5	S-69-90
138	703629.0	1767581.8	4457499.1	386661.9		5060.75	5060.45	5058.1	S-70-90

STATION	UTAH CENTRAL ZONE STATE PLANE COORDINATES (FEET)		UTM ZONE 12 COORDS (METERS)		ELEV MONUMENT (FEET)	ELEV T.O.C (FEET)	ELEV PVC (FEET)	ELEV GROUND (FEET)	DESCRIPTION
	NORTHING Y	EASTING X	NORTHING	EASTING					
139	703648.6	1769902.9	4457501.0	387369.3		5056.05	5055.74	5053.3	S-71-90
140	720479.6	1754294.1	4462657.5	382642.0		5052.30	5052.04	5050.1	S-74-90
141	718675.4	1754869.7	4462106.6	382814.2		5049.37	5049.12	5046.9	S-75-90
143	707843.9	1756935.8	4458802.1	383425.0			5040.92	5039.0	S-P3-90
144	715417.2	1754483.2	4461114.4	382690.8			5035.98	5033.9	S-P4-90
145	716539.1	1753687.2	4461457.7	382450.1			5034.61	5032.3	S-P5-90
146	706901.3	1769195.3	4458493.5	387159.3	5097.55				1-W
147	707482.2	1776904.3	4458657.1	389509.6	5118.47				3-S-MOUNND
148	707400.8	1776833.4	4458632.4	389487.8	5115.98				3-S-TRENCH
149	708141.6	1771777.0	4458867.0	387948.2	5105.30				8-W-TRENCH
150	707982.9	1773127.4	4458816.2	388359.5	5103.03				8-W-TRENCH
151	708109.6	1771173.4	4458858.3	387764.2	5113.77				23-NW
152	709272.1	1766901.1	4459220.0	386464.3	5078.07				25-NE
153	708310.5	1762956.4	4458933.8	385260.5	5043.52				25-W-WNDRW
154	708416.3	1764041.5	4458964.2	385591.4	5055.09				25-E-WNDRW
155	722431.3	1775312.2	4463215.4	389050.5	5318.36				26-NW
156	721906.8	1776669.9	4463053.2	389463.3	5337.17				26-NE
157	721609.0	1776504.8	4462962.8	389412.5	5326.29				26-SE
158	722031.3	1775049.9	4463094.0	388969.9	5307.74				26-SW

NOTES:

1. ALL ELEVATIONS WERE DETERMINED BY DIFFERENTIAL LEVELING METHODS.
2. THERE IS A VERTICAL DATUM SHIFT OF APPROXIMATELY 0.50 FEET FOR BENCH MARK ELEVATIONS REPORTED IN 1974 AND 1984 NGS PUBLICATIONS. THIS SHIFT WAS DETERMINED BY COMPARING THE REPORTED ELEVATIONS FOR BENCH MARKS A 62 AND X 2 AS SHOWN IN 1974 NGS PUBLICATION FOR VERTICAL CONTROL DATA FOR QUAD 401122 (ADJUSTED) AND AS SHOWN IN 1984 NGS PUBLICATION FOR PROJECT L-22149 FOR RELEVELING FROM SALT LAKE CITY TO MILFORD, UTAH IN 1970 (UNADJUSTED).

USC&GS BM	1974 (ADJ) QUAD 401122	1984 (UNADJ) L-22149	DIFFERENCE
A 62	5020.948	5021.464	-0.516
X 2	5062.349	5062.835	-0.486

AVE			-0.50

3. ELEVATIONS SHOWN ON THIS LISTING WERE ADJUSTED TO MATCH THE VERTICAL DATUM FROM VERTICAL CONTROL DATA FOR QUAD 401122 AS PUBLISHED BY NGS IN 1974. LEVEL RUNS AND SUBSEQUENT ELEVATIONS WERE INITIALLY BASED ON USC&GS BENCH MARKS ESTABLISHED IN 1970 IN RELEVELING FROM SALT LAKE CITY TO MILFORD, UTAH AS PUBLISHED BY NGS IN 1984 (PROJECT L-22149). A FACTOR OF -0.50 FEET WAS APPLIED TO THE INITIAL ELEVATIONS TO MATCH THE EARLIER DATUM.
4. LEVELING CHECK TO BENCH MARK LOCATED WITHIN THE TOOELE ARMY DEPOT (SOUTH AREA) STAMPED "N-BM-EL. 5107.19-NO 416-USA-S" SHOWS THE FOLLOWING RESULTS:

DATUM	ELEVATION	STAMPED ELEV	DIFFERENCE
1974 (ADJ) QUAD 401122	5107.18	5107.19	-0.01
1984 (UNADJ) L-22149	5107.68	5107.19	+0.49

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 NGVD 1929 ELEVATIONS (BASED ON NGS UNADJUSTED ELEVATIONS - 1984)

STATION	UTAH CENTRAL ZONE STATE PLANE COORDINATES (FEET)		UTM ZONE 12 COORDS (METERS)		ELEV MONUMENT (FEET)	ELEV T.O.C (FEET)	ELEV PVC (FEET)	ELEV GROUND (FEET)	DESCRIPTION
	NORTHING Y	EASTING X	NORTHING	EASTING					
101	722982.7	1773280.1	4463387.0	388432.2		5326.73	5326.53	5324.9	S-32-90
102	722673.4	1772776.5	4463293.7	388278.2		5314.74	5314.44	5312.4	S-33-90
103	722479.3	1773430.7	4463233.4	388477.2		5316.61	5316.29	5314.4	S-34-90
104	722299.0	1777552.7	4463171.2	389733.1		5370.29	5370.07	5368.1	S-35-90
105	722180.4	1774270.7	4463140.8	388732.7		5310.57	5310.24	5308.4	S-36-90
106	721977.0	1775053.5	4463077.5	388970.9		5309.57	5309.28	5307.4	S-37-90
107	721721.5	1775951.1	4462998.0	389244.0		5319.99	5319.67	5317.9	S-38-90
108	721431.9	1776961.7	4462908.0	389551.4		5333.78	5333.48	5331.8	S-39-90
109	721054.2	1778271.6	4462790.6	389950.0		5351.46	5351.17	5349.5	S-40-90
110	720807.6	1779095.0	4462714.0	390200.5		5378.92	5378.63	5376.6	S-41-90
111	716944.1	1771794.7	4461549.4	387969.0		5192.41	5192.11	5190.0	S-42-90
112	716777.2	1771531.9	4461499.0	387888.6		5187.72	5187.39	5185.5	S-43-90
113	716551.2	1771625.3	4461430.0	387916.7		5183.62	5183.30	5181.6	S-44-90
114	722103.9	1753905.6	4463153.1	382526.4		5049.57	5049.32	5047.5	S-45-90
115	716852.0	1755630.9	4461549.6	383043.0		5048.52	5048.24	5046.1	S-46-90
116	716373.5	1762994.1	4461390.9	385286.1		5147.12	5146.85	5144.8	S-47-90
117	716009.5	1762545.5	4461280.8	385148.7		5138.73	5138.42	5136.8	S-48-90
118	715908.9	1762679.1	4461249.9	385189.3		5140.96	5140.63	5139.0	S-49-90
119	713629.2	1770871.0	4460540.9	387681.7		5153.37	5153.09	5151.3	S-50-90
120	713440.2	1770606.9	4460483.7	387600.9		5148.48	5148.18	5146.6	S-51-90
121	713292.4	1770822.6	4460438.3	387666.4		5150.29	5149.99	5148.1	S-53-90
122	712853.8	1758818.3	4460325.6	384007.4		5050.92	5050.63	5048.9	S-54-90
123	712531.7	1758717.8	4460227.6	383976.2		5042.62	5042.40	5040.8	S-55-90
124	712272.1	1758765.4	4460148.4	383990.3		5053.04	5052.69	5050.3	S-56-90
125	711388.2	1758991.4	4459878.7	384057.6		5038.23	5037.94	5035.6	S-57-90
126	711933.6	1757580.3	4460047.3	383628.5		5036.85	5036.53	5034.7	S-58-90
127	711689.0	1757670.1	4459972.6	383655.4		5036.14	5035.72	5034.0	S-59-90
128	711414.4	1757770.9	4459888.8	383685.7		5035.27	5034.91	5033.3	S-60-90
129	707786.5	1776938.8	4458749.7	389520.6		5123.24	5122.94	5120.9	S-61-90
130	707268.7	1776834.7	4458592.1	389488.0		5118.29	5117.99	5115.6	S-62-90
131	707213.4	1776945.8	4458575.1	389521.8		5118.72	5118.45	5116.6	S-63-90
132	708445.0	1761410.8	4458977.5	384789.7		5045.76	5045.45	5042.7	S-64-90
133	705659.9	1761393.9	4458128.8	384779.7		5038.49	5038.17	5035.4	S-65-90
134	708126.9	1764119.5	4458875.9	385614.6		5059.16	5058.86	5056.2	S-66-90
135	703444.4	1760522.9	4457455.2	384510.4		5039.14	5038.86	5036.9	S-67-90
136	703634.0	1765856.2	4457503.6	386136.0		5059.49	5059.22	5057.2	S-68-90
137	706841.1	1770267.6	4458473.3	387486.0		5104.75	5104.42	5102.0	S-69-90
138	703629.0	1767581.8	4457499.1	386661.9		5061.25	5060.95	5058.6	S-70-90

STATION	UTAH CENTRAL ZONE STATE PLANE COORDINATES (FEET)		UTM ZONE 12 COORDS (METERS)		ELEV MONUMENT (FEET)	ELEV T.O.C (FEET)	ELEV PVC (FEET)	ELEV GROUND (FEET)	DESCRIPTION
	NORTHING Y	EASTING X	NORTHING	EASTING					
139	703648.6	1769902.9	4457501.0	387369.3		5056.55	5056.24	5053.8	S-71-90
140	720479.6	1754294.1	4462657.5	382642.0		5052.80	5052.54	5050.6	S-74-90
141	718675.4	1754869.7	4462106.6	382814.2		5049.87	5049.62	5047.4	S-75-90
143	707843.9	1756935.8	4458802.1	383425.0			5041.42	5039.5	S-P3-90
144	715417.2	1754483.2	4461114.4	382690.8			5036.48	5034.4	S-P4-90
145	716539.1	1753687.2	4461457.7	382450.1			5035.11	5032.8	S-P5-90
146	706901.3	1769195.3	4458493.5	387159.3	5098.05				1-N
147	707482.2	1776904.3	4458657.1	389509.6	5118.97				3-S-MOUNND
148	707400.8	1776833.4	4458632.4	389487.8	5116.48				3-S-TRENCH
149	708141.6	1771777.0	4458867.0	387948.2	5105.80				8-W-TRENCH
150	707982.9	1773127.4	4458816.2	388359.5	5103.53				8-W-TRENCH
151	708109.6	1771173.4	4458858.3	387764.2	5114.27				23-NW
152	709272.1	1766901.1	4459220.0	386464.3	5078.57				25-NE
153	708310.5	1762956.4	4458933.8	385260.5	5044.02				25-W-WNDRW
154	708416.3	1764041.5	4458964.2	385591.4	5055.59				25-E-WNDRW
155	722431.3	1775312.2	4463215.4	389050.5	5318.86				26-NW
156	721906.8	1776669.9	4463053.2	389463.3	5337.67				26-NE
157	721609.0	1776504.8	4462962.8	389412.5	5326.79				26-SE
158	722031.3	1775049.9	4463094.0	388969.9	5308.24				26-SW

NOTES:

- ALL ELEVATIONS WERE DETERMINED BY DIFFERENTIAL LEVELING METHODS.
- THERE IS A VERTICAL DATUM SHIFT OF APPROXIMATELY 0.50 FEET FOR BENCH MARK ELEVATIONS REPORTED IN 1974 AND 1984 NGS PUBLICATIONS. THIS SHIFT WAS DETERMINED BY COMPARING THE REPORTED ELEVATIONS FOR BENCH MARKS A 62 AND X 2 AS SHOWN IN 1974 NGS PUBLICATION FOR VERTICAL CONTROL DATA FOR QUAD 401122 (ADJUSTED) AND AS SHOWN IN 1984 NGS PUBLICATION FOR PROJECT L-22149 FOR RELEVELING FROM SALT LAKE CITY TO MILFORD, UTAH IN 1970 (UNADJUSTED).

USC&GS BM	1974 (ADJ) QUAD 401122	1984 (UNADJ) L-22149	DIFFERENCE
A 62	5020.948	5021.464	-0.516
X 2	5062.349	5062.835	-0.486

AVE			-0.50

- ELEVATIONS SHOWN ON THIS LISTING ARE BASED ON USC&GS BENCH MARKS ESTABLISHED IN 1970 IN RELEVELING FROM SALT LAKE CITY TO MILFORD, UTAH. THE BENCH MARK ELEVATIONS WERE COMPUTED AND PUBLISHED BY NGS IN 1984 (PROJECT L-22149) BUT ARE SUBJECT TO FINAL ADJUSTMENT. SUBTRACT 0.50 FEET FROM THESE ELEVATIONS TO MATCH THE ELEVATIONS FROM VERTICAL CONTROL DATA FOR QUAD 401122 AS PUBLISHED BY NGS IN 1974.
- LEVELING CHECK TO BENCH MARK LOCATED WITHIN THE TOOELE ARMY DEPOT (SOUTH AREA) STAMPED "N-BM-EL. 5107.19-NO 416-USA-S" SHOWS THE FOLLOWING RESULTS:

DATUM	ELEVATION	STAMPED ELEV	DIFFERENCE
1974 (ADJ) QUAD 401122	5107.18	5107.19	-0.01
1984 (UNADJ) L-22149	5107.68	5107.19	+0.49