



REPORT OF SURVEY

Lower NC McIntosh

08 February 2012

Prepared for

United States Geological Survey
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REPORT OF LiDAR SURVEY McINTOSH COUNTY, OKLAHOMA

INTRODUCTION

Terrasurv Inc. was tasked by Fugro-Earthdata International to perform a control survey in support of LiDAR mapping of a portion of McIntosh County in east-central Oklahoma. The map in figure 1 shows the location of the survey, with flight lines, existing control used, and control established for the LiDAR project:

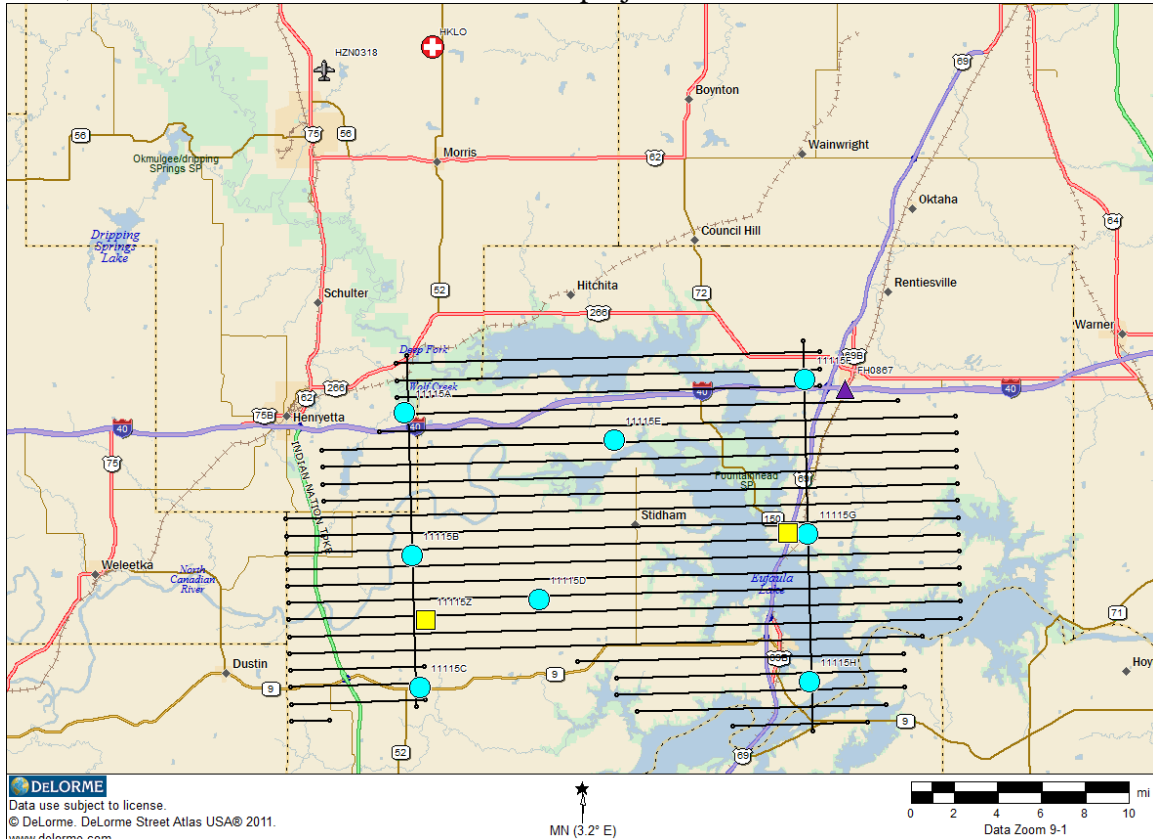


Figure 1-Project Map

The map legend is summarized below:

Symbol	Description	Quantity
Blue Circle	LiDAR Control Points	8
Yellow Square	Temporary base stations	2
Red circle/white cross	CORS	1
Airplane	ABGPS base stations	1
Purple triangle	NSRS benchmark	1

For control purposes, this project was combined with a similar project to the west in Pottawatomie County.

In addition, 60 Quality Control (QC) points were established, with 20 in each of three land cover categories (bare ground, high brush, and woods). These were set at 20 discrete

locations, with three points, one in each of the three categories, included at the 20 locations. The locations are shown in figure 2:

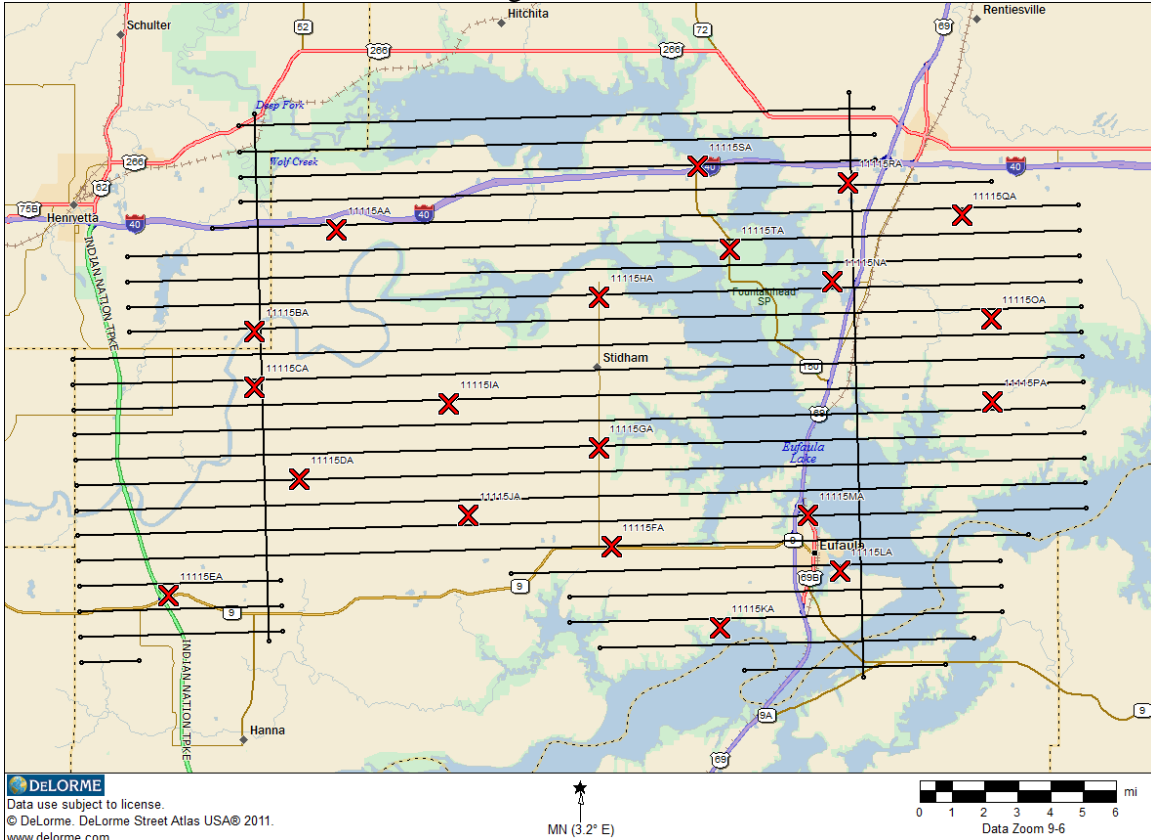


Figure 2 - QC Point Locations

CONTROL

The National Spatial Reference System (NSRS) was used to provide control for the network. The table below summarizes the existing control stations.

Station Name	PID	H Accuracy	V accuracy (ellip)	Ortho H Accuracy	Comments
HKLO	AF9526	CORS	CORS	HGT MOD	CORS
E 201	FH0867	-----	-----	1-II	NSRS ground
D 194	FJ0719	1.62 cm	3.59 cm	1-II	NSRS ground
E 201	FJ0737	-----	-----	1-II	NSRS ground
ORTE	DE7174	CORS	CORS	-----	CORS

The first two stations in the table above are in the vicinity of this project. The horizontal datum was the North American Datum of 1983 (NSRS2007). The vertical datum was the North American Vertical Datum of 1988 (NAVD 1988). The GEOID09 model was used.

STATIONS

The following table contains a list of static GPS stations that were established or occupied for this project:

Station Name	GPSID	USGS Quad	Description
HZN0318	HZN0318	OKMULGEE NORTH	ABGPS Base point, set by flight crew
LM-01	11115A	HENRYETTA	bare ground, in the north lane of E 0185 Rd (Holly Rd)

Station Name	GPSID	USGS Quad	Description
LM-02	11115B	HENRYETTA SW	sparse grass, on the west side of Hwy 52 @ the south side of a dirt drive & just north of the intersection with E 1150 Rd
LM-03	11115C	RAIFORD	gravel, centerline of a field access road leading to the north off Hwy 52/Hwy 9
LM-04	11115D	RAIFORD	bare ground, in the north lane of Lenna Rd just west of a 90 degree turn
LM-05	11115E	PIERCE	sparse grass, on the east side of NS 410 Rd in a small clearing in the brush
LM-06	11115F	CHECOTAH	bare ground, in the south lane of E 1070 Rd
LM-07	11115G	EUFAULA	grass, on the south side of E 1140 Rd & west of a concrete foundation
LM-08	11115H	EUFAULA	cut grass, in the northwest corner of a grass parking area for a church

GPS OBSERVATIONS

For the LiDAR control (eight stations), two Trimble dual frequency receivers were used in a static differential mode to measure vectors from the two temporary base stations to each of the new stations and the NSRS benchmark. Observations were made on day 362 of 2011. The following table summarizes the occupations (duration in minutes, HI in meters):

GPSID	UTC Start	Duration Minutes	HI meters	Filename
HZN0318	12/09/2011 16:51	561	1.800	BH318A11.11o
HKLO	12/09/2011 16:51	560	0.000	HKLO3430.11o
11115Z	12/28/2011 18:26	134	0.000	62073622.DAT
11115Y	12/28/2011 21:09	166	0.000	62073623.DAT
11115B	12/28/2011 18:35	15	2.000	81103629.DAT
11115A	12/28/2011 19:04	16	2.000	8110362A.DAT
11115C	12/28/2011 19:41	15	2.000	8110362B.DAT
11115D	12/28/2011 20:10	15	2.000	8110362C.DAT
11115H	12/28/2011 21:30	15	2.000	8110362D.DAT
11115G	12/28/2011 22:02	15	2.000	8110362E.DAT
11115E	12/28/2011 22:35	16	2.000	8110362F.DAT
11115F	12/28/2011 23:05	16	2.000	8110362G.DAT
FH0867	12/28/2011 23:28	15	2.000	8110362H.DAT
HKLO	12/28/2011 12:43	675	0.000	hklo362.11o

GPS DATA PROCESSING

The GPS data collected was downloaded to a PC and processed using the baseline processor in Trimble Business Center (TBC) version 2.64. The data was processed radially from the temporary base stations. The precise ephemeris (IGS Rapid) was used. In addition to the LiDAR control network observed on 12/28/2011, observations were processed with data obtained by the flight crew on 12/9/11 at a temporary base station located at the Okmulgee Airport. All solutions utilized the integer bias fixed solution. The table below summarizes the processing results:

From	To	UTC start	Duration	Length	H. Prec	V. Prec
11115Z	11115B	12/28/11 18:35	15	4822	0.012	0.027
11115Z	11115A	12/28/11 19:04	16	15230	0.013	0.025
11115Z	11115C	12/28/11 19:41	15	4959	0.017	0.035

11115Z	11115D	12/28/11 20:10	15	8512	0.012	0.029
11115Y	11115H	12/28/11 21:31	14	11011	0.015	0.016
11115Y	11115G	12/28/11 22:02	15	1408	0.005	0.007
11115Y	11115E	12/28/11 22:35	16	14489	0.011	0.020
11115Y	11115F	12/28/11 23:05	16	11284	0.012	0.021
11115Y	FH0867	12/28/11 23:28	15	11085	0.018	0.025
HKLO	11115Y	12/28/11 21:09	165	44086	0.005	0.022
HKLO	11115Z	12/28/11 18:26	134	41872	0.009	0.029
HKLO	OKTE	12/28/11 12:43	676	104941	0.005	0.014
OKTE	11115Z	12/28/11 18:26	134	93739	0.016	0.055

All of the baselines in this project meet the criteria for acceptable solutions.

LEAST SQUARES ADJUSTMENTS

The LiDAR control network was adjusted using GEOLAB, a least squares adjustment program from Microsearch Corp. The processed baselines were parsed to form an input file. No scaling of the apriori baseline statistics was done. Station errors (HI and centering) of 0.005 m were also included. Geoid separations for each station were interpolated using the GEOID09 model. This project was combined with a similar project to the west for the least squares adjustment.

The adjustment constrained the CORS **OKTE** horizontally (latitude and longitude), the CORS **HKLO** in all three dimensions (latitude, longitude, and orthometric height), and two of the NSRS benchmarks (**D 194** and **K 195**) in orthometric height only. The estimated variance factor was 2.27. The graph below in figure 2 shows the horizontal and vertical residuals versus baseline length for this constrained adjustment. This adjustment provided the adjusted positions and elevations for the stations in the network.

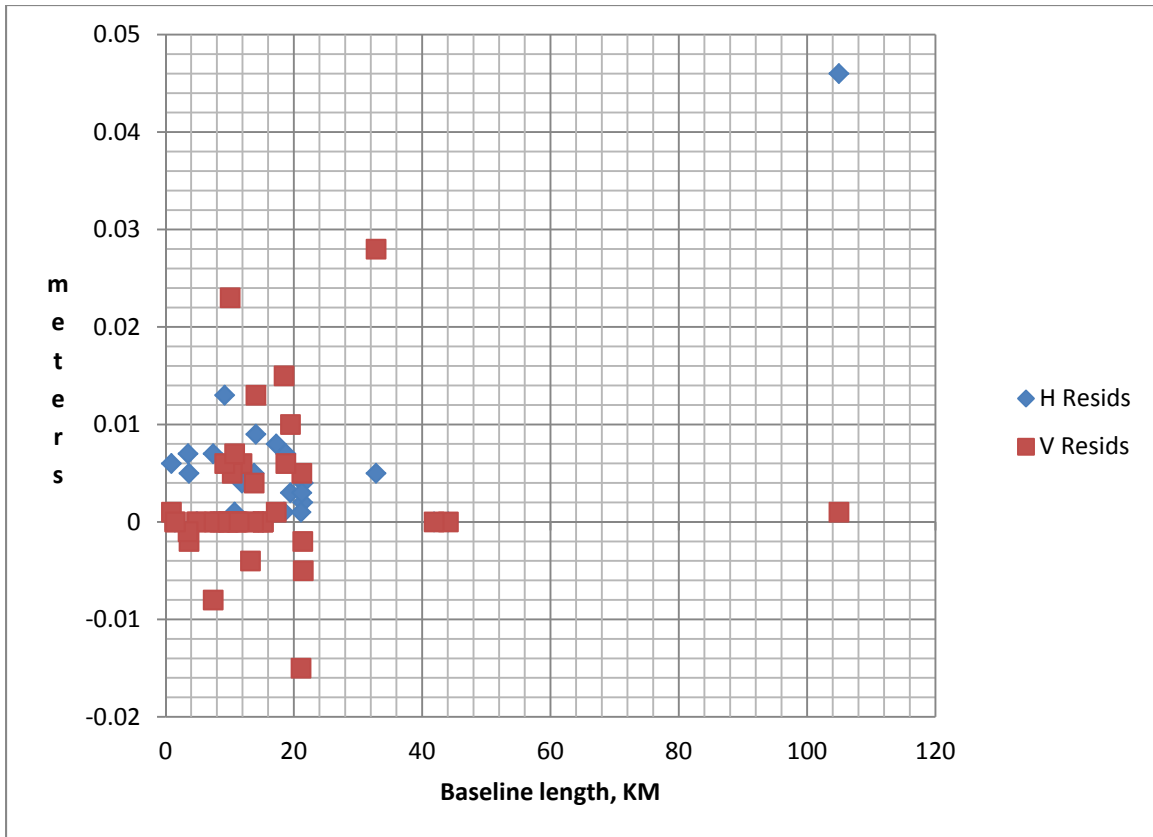


Figure 3-H & V residuals versus baseline length

The table below shows the 2-D and 1-D Station Confidence Regions (95.000 percent, in meters) for the stations in the network:

Station Name	Semi-Major Axis	Azimuth	Semi-Minor Axis	Vertical
11115A	0.043	151	0.041	0.065
11115B	0.044	114	0.041	0.067
11115C	0.045	168	0.041	0.075
11115D	0.043	124	0.041	0.069
11115E	0.041	163	0.039	0.054
11115F	0.042	162	0.039	0.054
11115G	0.038	175	0.037	0.045
11115H	0.044	8	0.039	0.050
11115Y	0.027	178	0.026	0.039
11115Z	0.030	110	0.027	0.049

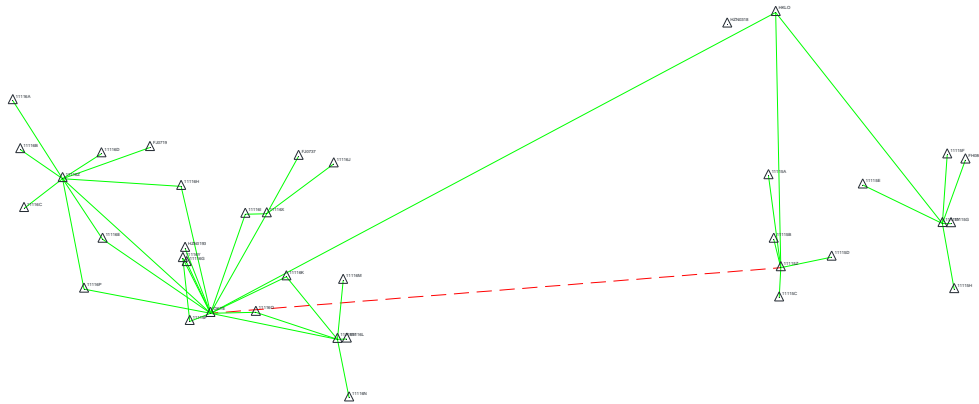
QUALITY CONTROL SURVEYS

An additional survey requirement was to survey blind Quality Control (QC) points in three land cover classifications throughout the project area. The requirement was for 20 of each. The bare ground points were surveyed by static methods from temporary base stations and/or CORS. The high brush and forest/woods points were surveyed using a total station. The high brush and forest/woods points were surveyed by establishing an azimuth mark for each of the bare ground points, and utilizing a Trimble S6 high accuracy total station to traverse into nearby woods or brush areas to determine the

coordinates and elevations of the QC points. This data was collected in January of 2012, and adjusted to be consistent and homogenous with the previously established LiDAR control points.

SUMMARY

A geodetic control network was established for LiDAR control for a portion of McIntosh County in east central Oklahoma. The resulting accuracy of the surveyed points is ± 0.05 m with respect to the NAD 1983 (2007)/NAVD 1988 coordinate systems.



Adjusted Coordinates – NAD 1983 (2007) /NAVD 1988

UTM Zone 15

Ellipsoidal Height = NAVD1988 + GEOID09

Station Name	GPSID	Latitude	Longitude	Ortho Height	Ellip Height	UTM 15 Northing	UTM 15 Easting
HZN0318	HZN0318	35°40'04.08985" N	95°57'06.18227" W	214.306	185.217	3951118.925	232819.371
LM-01	11115A	35°26'31.01760" N	95°53'08.79860" W	187.599	158.303	3925882.477	238055.169
LM-02	11115B	35°20'52.33008" N	95°52'48.08776" W	259.572	230.218	3915429.071	238273.361
LM-03	11115C	35°15'39.03882" N	95°52'24.87944" W	213.391	183.954	3905756.705	238579.291
LM-04	11115D	35°19'07.09140" N	95°46'36.08674" W	206.046	176.450	3911917.318	247575.484
LM-05	11115E	35°25'24.98929" N	95°42'58.68366" W	197.161	167.542	3923411.041	253386.656
LM-06	11115F	35°27'50.15708" N	95°33'43.82870" W	197.244	167.484	3927510.710	267499.078
LM-07	11115G	35°21'43.37878" N	95°33'34.95624" W	190.670	160.753	3916201.977	267429.966
LM-08	11115H	35°15'52.35077" N	95°33'29.02325" W	209.768	179.680	3905380.697	267300.377

Oklahoma South Zone State Plane Coordinates

NAD83 (NSRS2007)/NAVD 1988

Station Name	GPSID	SPC N meters	SPC E meters	Ortho Height (m)	SPC N US FT	SPC E US FT	Ortho Height (ft)
HZN0318	HZN0318	260849.468	785460.706	214.306	855803.629	2576965.665	703.102
LM-01	11115A	235917.452	791955.201	187.599	774005.842	2598273.021	615.481
LM-02	11115B	225492.377	792696.665	259.572	739802.907	2600705.640	851.612
LM-03	11115C	215851.573	793485.943	213.391	708173.034	2603295.132	700.100
LM-04	11115D	222451.865	802159.194	206.046	729827.493	2631750.623	676.003
LM-05	11115E	234218.153	807385.865	197.161	768430.724	2648898.457	646.852
LM-06	11115F	239018.344	821271.614	197.244	784179.351	2694455.287	647.125
LM-07	11115G	227722.879	821768.526	190.670	747120.811	2696085.573	625.556
LM-08	11115H	216911.353	822179.957	209.768	711649.999	2697435.409	688.214



QC POINTS

OK South Zone State Plane Coordinates – meters & feet

UTM Zone 15 – meters

NAD83 (NSRS2007)/NAVD1988

GPSID	SPC N meters	SPC E Meters	NAVD88 Meters	SPC N US ft	SPC E US ft	NAVD88 US ft	UTM N meters	UTM E meters	Description
11115AD	234627.602	796114.349	267.739	769774.056	2611918.494	878.407	3924385.142	242145.996	BARE
11115BA	229496.473	792205.778	195.867	752939.679	2599095.124	642.607	3919454.405	237983.543	BARE
11115CA	226814.478	792253.266	256.577	744140.501	2599250.925	841.786	3916772.283	237896.576	BARE
11115DA	222350.250	794580.795	292.180	729494.112	2606887.158	958.594	3912195.204	239998.534	BARE
11115EA	216583.277	788288.153	268.853	710573.635	2586242.048	882.062	3906747.952	233422.276	BARE
11115FA	219423.535	809932.594	222.019	719892.048	2657253.852	728.407	3908502.778	255190.323	BARE
11115GA	224234.188	809230.279	189.241	735674.998	2654949.675	620.868	3913344.103	254729.348	BARE
11115HA	231529.494	809051.352	196.749	759609.682	2654362.645	645.501	3920641.496	254915.857	BARE
11115IA	226193.582	801784.408	196.152	742103.445	2630521.013	643.542	3915674.471	247388.369	BARE
11115JA	220760.648	802860.068	213.933	724278.892	2634050.073	701.879	3910192.521	248191.093	BARE
11115KA	215572.269	815363.467	194.788	707256.686	2675071.642	639.067	3904383.574	260423.557	BARE
11115LA	218483.255	821190.696	198.178	716807.146	2694189.808	650.189	3907000.488	266390.653	BARE
11115MA	221150.965	819514.789	185.144	725559.458	2688691.435	607.427	3909749.354	264849.763	BARE
11115NA	232557.104	820436.214	178.311	762981.099	2691714.477	585.009	3921097.970	266340.955	BARE
11115OA	230971.163	828307.899	224.667	757777.892	2717540.164	737.095	3919119.709	274125.087	BARE
11115PA	226918.554	828412.476	210.376	744481.957	2717883.264	690.209	3915066.136	274026.833	BARE
11115QA	235953.110	826713.289	195.397	774122.829	2712308.517	641.065	3924176.180	272781.511	BARE
11115RA	237408.193	821121.081	203.978	778896.714	2693961.412	669.218	3925909.774	267268.043	BARE
11115SA	238017.660	813702.173	186.593	780896.273	2669621.213	612.181	3926890.321	259887.220	BARE
11115TA	234002.739	815409.404	191.957	767723.987	2675222.354	629.779	3922793.867	261391.600	BARE
11115TD	233746.288	815369.637	186.880	766882.612	2675091.883	613.122	3922539.663	261339.028	HIGH
11115AA	234561.115	796128.600	269.841	769555.924	2611965.249	885.303	3924317.999	242156.901	HIGH
11115BD	229551.369	792187.846	190.152	753119.784	2599036.292	623.857	3919510.153	237968.378	HIGH



GPSID	SPC N meters	SPC E Meters	NAVD88 Meters	SPC N US ft	SPC E US ft	NAVD88 US ft	UTM N meters	UTM E meters	Description
11115CD	226804.345	792244.224	257.178	744107.255	2599221.258	843.758	3916762.611	237887.034	HIGH
11115DD	222431.057	794540.737	291.842	729759.226	2606755.734	957.485	3912277.949	239962.556	HIGH
11115ED	216601.799	788354.766	269.886	710634.403	2586460.596	885.451	3906763.125	233489.765	HIGH
11115FD	219399.372	810093.403	214.337	719812.774	2657781.441	703.204	3908470.594	255349.775	HIGH
11115GD	223924.552	809208.449	190.656	734659.133	2654878.053	625.511	3913035.848	254692.041	HIGH
11115HD	231497.137	809074.526	197.538	759503.523	2654438.674	648.089	3920608.009	254937.388	HIGH
11115ID	226129.312	801910.001	198.036	741892.583	2630933.061	649.723	3915603.969	247510.631	HIGH
11115JD	220889.261	802856.947	211.179	724700.850	2634039.834	692.843	3910321.176	248194.411	HIGH
11115KD	215602.323	815386.519	194.561	707355.287	2675147.272	638.322	3904412.448	260448.089	HIGH
11115LD	218498.892	821228.920	199.494	716858.447	2694315.214	654.507	3907014.198	266429.620	HIGH
11115MD	221120.600	819489.327	186.760	725459.835	2688607.899	612.728	3909720.292	264822.808	HIGH
11115ND	232570.445	820552.028	187.791	763024.867	2692094.445	616.111	3921105.499	266457.319	HIGH
11115OD	231098.115	828308.462	219.454	758194.397	2717542.012	719.992	3919246.498	274132.002	HIGH
11115PD	227198.785	828441.042	204.544	745401.348	2717976.986	671.075	3915344.645	274069.385	HIGH
11115QD	235963.193	826556.378	193.429	774155.909	2711793.717	634.608	3924194.108	272625.272	HIGH
11115RD	237389.392	821030.521	203.546	778835.031	2693664.302	667.801	3925895.529	267176.636	HIGH
11115SD	238197.149	813670.774	184.607	781485.147	2669518.199	605.665	3927071.205	259864.847	HIGH
11115AC	234627.687	796191.936	267.695	769774.337	2612173.044	878.263	3924381.336	242223.519	WOODS
11115BC	229554.088	792242.326	190.806	753128.704	2599215.031	626.003	3919510.139	238022.948	WOODS
11115CC	226780.868	792288.906	256.374	744030.229	2599367.851	841.120	3916736.914	237930.502	WOODS
11115DC	222397.759	794590.281	290.350	729649.980	2606918.280	952.590	3912242.198	240010.391	WOODS
11115EC	216596.737	788393.779	270.284	710617.794	2586588.591	886.757	3906756.114	233528.493	WOODS
11115FC	219376.712	810135.029	213.784	719738.429	2657918.007	701.390	3908445.873	255390.228	WOODS
11115GC	223986.827	809213.220	189.431	734863.449	2654893.706	621.492	3913097.827	254699.925	WOODS
11115HC	231462.258	809074.843	197.337	759389.092	2654439.713	647.430	3920573.148	254935.957	WOODS
11115IC	226175.929	801877.075	201.343	742045.527	2630825.038	660.573	3915652.193	247480.069	WOODS
11115JC	220838.678	802850.818	210.753	724534.896	2634019.727	691.445	3910270.945	248185.757	WOODS



GPSID	SPC N meters	SPC E Meters	NAVD88 Meters	SPC N US ft	SPC E US ft	NAVD88 US ft	UTM N meters	UTM E meters	Description
11115KC	215648.791	815414.477	195.522	707507.743	2675238.997	641.475	3904457.475	260478.343	WOODS
11115LC	218477.220	821256.960	199.109	716787.344	2694407.208	653.243	3906991.146	266456.549	WOODS
11115MC	221215.451	819458.814	182.347	725771.025	2688507.792	598.250	3909816.575	264797.068	WOODS
11115NC	232510.587	820517.876	187.624	762828.484	2691982.398	615.563	3921047.412	266420.205	WOODS
11115OC	231106.116	828323.497	219.538	758220.647	2717591.338	720.268	3919253.738	274147.421	WOODS
11115PE	227114.387	828393.851	203.031	745124.452	2717822.161	666.111	3915262.695	274018.022	WOODS
11115QC	235934.830	826568.548	193.725	774062.854	2711833.644	635.579	3924165.165	272636.009	WOODS
11115RC	237377.637	821002.965	203.371	778796.465	2693573.893	667.226	3925885.166	267148.519	WOODS
11115SC	238207.800	813654.271	184.203	781520.091	2669464.055	604.339	3927082.672	259848.894	WOODS
11115TC	233789.939	815378.134	190.128	767025.824	2675119.761	623.778	3922582.845	261349.703	WOODS



McIntosh & Pottawatomie, OK LiDAR Control



Station Name: LM-01 GPSID: 11115A USGS Quad: HENRYETTA

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°26'31.01760" N Longitude: 95°53'08.79860" W Ellip H: 158.303 meters

Oklahoma South Zone State Plane Coordinates

Northing: 235,917.452 Easting: 791,955.201 Ortho H: 187.599 meters

Northing: 774,005.842 Easting: 2,598,273.021 Ortho H: 615.481 US Survey FT

UTM Zone 14 meters

Northing: 3,926,512.856 Easting: 782,687.517

UTM Zone 15 meters

Northing: 3,925,882.477 Easting: 238,055.169

Description: bare ground, in the north lane of E 0185 Rd (Holly Rd)

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: LM-02 GPSID: 11115B USGS Quad: HENRYETTA SW

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°20'52.33008" N Longitude: 95°52'48.08776" W Ellip H: 230.218 meters

Oklahoma South Zone State Plane Coordinates

Northing: 225,492.377 Easting: 792,696.665 Ortho H: 259.572 meters

Northing: 739,802.907 Easting: 2,600,705.640 Ortho H: 851.612 US Survey FT

UTM Zone 14 meters

Northing: 3,916,090.442 Easting: 783,539.479

UTM Zone 15 meters

Northing: 3,915,429.071 Easting: 238,273.361

Description: sparse grass, on the west side of Hwy 52 @ the south side of a dirt drive & just north of the intersection with E 1150 Rd

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: LM-03 GPSID: 11115C USGS Quad: RAIFORD

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°15'39.03882" N Longitude: 95°52'24.87944" W Ellip H: 183.954 meters

Oklahoma South Zone State Plane Coordinates

Northing: 215,851.573 Easting: 793,485.943 Ortho H: 213.391 meters

Northing: 708,173.034 Easting: 2,603,295.132 Ortho H: 700.100 US Survey FT

UTM Zone 14 meters

Northing: 3,906,452.869 Easting: 784,430.355

UTM Zone 15 meters

Northing: 3,905,756.705 Easting: 238,579.291

Description: gravel, centerline of a field access road leading to the north off Hwy 52/Hwy 9

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: LM-04 GPSID: 11115D USGS Quad: RAIFORD

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°19'07.09140" N Longitude: 95°46'36.08674" W Ellip H: 176.450 meters

Oklahoma South Zone State Plane Coordinates

Northing: 222,451.865 Easting: 802,159.194 Ortho H: 206.046 meters

Northing: 729,827.493 Easting: 2,631,750.623 Ortho H: 676.003 US Survey FT

UTM Zone 14 meters

Northing: 3,913,147.886 Easting: 793,039.203

UTM Zone 15 meters

Northing: 3,911,917.318 Easting: 247,575.484

Description: bare ground, in the north lane of Lenna Rd just west of a 90 degree turn

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: LM-05 GPSID: 11115E USGS Quad: PIERCE

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°25'24.98929" N Longitude: 95°42'58.68366" W Ellip H: 167.542 meters

Oklahoma South Zone State Plane Coordinates

Northing: 234,218.153 Easting: 807,385.865 Ortho H: 197.161 meters

Northing: 768,430.724 Easting: 2,648,898.457 Ortho H: 646.852 US Survey FT

UTM Zone 14 meters

Northing: 3,924,976.405 Easting: 798,144.516

UTM Zone 15 meters

Northing: 3,923,411.041 Easting: 253,386.656

Description: sparse grass, on the east side of NS 410 Rd in a small clearing in the brush

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: LM-06 GPSID: 11115F USGS Quad: CHECOTAH

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°27'50.15708" N Longitude: 95°33'43.82870" W Ellip H: 167.484 meters

Oklahoma South Zone State Plane Coordinates

Northing: 239,018.344 Easting: 821,271.614 Ortho H: 197.244 meters

Northing: 784,179.351 Easting: 2,694,455.287 Ortho H: 647.125 US Survey FT

UTM Zone 14 meters

Northing: 3,929,927.716 Easting: 811,988.005

UTM Zone 15 meters

Northing: 3,927,510.710 Easting: 267,499.078

Description: bare ground, in the south lane of E 1070 Rd

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: LM-07 GPSID: 11115G USGS Quad: EUFAULA

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°21'43.37878" N Longitude: 95°33'34.95624" W Ellip H: 160.753 meters

Oklahoma South Zone State Plane Coordinates

Northing: 227,722.878 Easting: 821,768.526 Ortho H: 190.670 meters

Northing: 747,120.811 Easting: 2,696,085.573 Ortho H: 625.556 US Survey FT

UTM Zone 14 meters

Northing: 3,918,629.584 Easting: 812,605.610

UTM Zone 15 meters

Northing: 3,916,201.977 Easting: 267,429.966

Description: grass, on the south side of E 1140 Rd & west of a concrete foundation

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: LM-08 GPSID: 11115H USGS Quad: EUFAULA

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°15'52.35077" N Longitude: 95°33'29.02325" W Ellip H: 179.680 meters

Oklahoma South Zone State Plane Coordinates

Northing: 216,911.353 Easting: 822,179.957 Ortho H: 209.768 meters

Northing: 711,649.999 Easting: 2,697,435.409 Ortho H: 688.214 US Survey FT

UTM Zone 14 meters

Northing: 3,907,814.474 Easting: 813,131.615

UTM Zone 15 meters

Northing: 3,905,380.697 Easting: 267,300.377

Description: cut grass, in the northwest corner of a grass parking area for a church

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: P-01 GPSID: 11116A USGS Quad: HORSESHOE LAKE

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°34'49.49792" N Longitude: 97°14'49.77124" W Ellip H: 342.769 meters

Oklahoma South Zone State Plane Coordinates

Northing: 249,525.509 Easting: 668,241.997 Ortho H: 370.079 meters

Northing: 818,651.607 Easting: 2,192,390.618 Ortho H: 1,214.168 US Survey FT

UTM Zone 14 meters

Northing: 3,938,825.874 Easting: 658,820.085

UTM Zone 15 meters

Northing: 3,945,721.847 Easting: 115,081.638

Description: grass, on the east side of N Indian Meridian Rd, just north of a dirt drive & west of a brush area

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: P-02 GPSID: 11116B USGS Quad: HORSESHOE LAKE

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°30'28.30257" N Longitude: 97°14'06.60322" W Ellip H: 303.132 meters

Oklahoma South Zone State Plane Coordinates

Northing: 241,483.360 Easting: 669,389.921 Ortho H: 330.296 meters

Northing: 792,266.658 Easting: 2,196,156.764 Ortho H: 1,083.646 US Survey FT

UTM Zone 14 meters

Northing: 3,930,797.323 Easting: 660,050.832

UTM Zone 15 meters

Northing: 3,937,621.038 Easting: 115,822.315

Description: cut grass, on the north side of NE 36th St, just east of a fenced in high pressure gas line

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: P-03 GPSID: 11116C USGS Quad: HARRAH

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°25'14.08205" N Longitude: 97°13'48.94153" W Ellip H: 340.383 meters

Oklahoma South Zone State Plane Coordinates

Northing: 231,802.480 Easting: 669,908.864 Ortho H: 367.357 meters

Northing: 760,505.303 Easting: 2,197,859.333 Ortho H: 1,205.237 US Survey FT

UTM Zone 14 meters

Northing: 3,921,123.625 Easting: 660,669.361

UTM Zone 15 meters

Northing: 3,927,913.068 Easting: 115,851.809

Description: cut grass, on the south side of SE 44th St & east of S Triple X Rd, between a utility pole & a small planter with two trees

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: P-04 GPSID: 11116D USGS Quad: MCL0UD

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°29'57.55286" N Longitude: 97°05'18.83805" W Ellip H: 307.585 meters

Oklahoma South Zone State Plane Coordinates

Northing: 240,646.087 Easting: 682,698.656 Ortho H: 334.883 meters
Northing: 789,519.703 Easting: 2,239,820.509 Ortho H: 1,098.695 US Survey FT

UTM Zone 14 meters

Northing: 3,930,097.690 Easting: 673,365.885

UTM Zone 15 meters

Northing: 3,936,110.571 Easting: 129,088.887

Description: sparse grass, on the east side of Hwy 102 & just south of a large drain ditch

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: P-05 GPSID: 11116E USGS Quad: SHAWNEE RESERVOIR

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°22'22.64742" N Longitude: 97°05'22.59889" W Ellip H: 316.177 meters

Oklahoma South Zone State Plane Coordinates

Northing: 226,625.395 Easting: 682,730.319 Ortho H: 343.183 meters

Northing: 743,520.149 Easting: 2,239,924.389 Ortho H: 1,125.926 US Survey FT

UTM Zone 14 meters

Northing: 3,916,079.133 Easting: 673,542.193

UTM Zone 15 meters

Northing: 3,922,088.585 Easting: 128,412.614

Description: gravel, centerline of a gravel field access drive on the west side of Patterson Rd & south of the intersection with May Addition Rd

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: P-06 GPSID: 11116F USGS Quad: BROOKSVILLE

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°14'55.65977" N Longitude: 96°56'07.85703" W Ellip H: 293.476 meters

Oklahoma South Zone State Plane Coordinates

Northing: 212,987.468 Easting: 696,878.268 Ortho H: 320.406 meters

Northing: 698,776.385 Easting: 2,286,341.449 Ortho H: 1,051.199 US Survey FT

UTM Zone 14 meters

Northing: 3,902,587.445 Easting: 687,829.288

UTM Zone 15 meters

Northing: 3,907,738.919 Easting: 141,873.333

Description: cut grass, on the southwest side of US 177 Business in the center of a grass field access road

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: P-07 GPSID: 11116G USGS Quad: SHAWNEE

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°20'09.84496" N Longitude: 96°56'19.83214" W Ellip H: 295.971 meters

Oklahoma South Zone State Plane Coordinates

Northing: 222,666.523	Easting: 696,473.753	Ortho H: 323.076 meters
Northing: 730,531.752	Easting: 2,285,014.304	Ortho H: 1,059.959 US Survey FT

UTM Zone 14 meters

Northing: 3,912,262.038 Easting: 687,325.308

UTM Zone 15 meters

Northing: 3,917,437.390 Easting: 141,955.811

Description: cut grass, on the west side of N Kennedy Ave & east of a side walk & south of W Locust St

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: P-08 GPSID: 11116H USGS Quad: AYDELOTTE

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°26'55.79904" N Longitude: 96°56'45.14315" W Ellip H: 292.028 meters

Oklahoma South Zone State Plane Coordinates

Northing: 235,170.616 Easting: 695,703.922 Ortho H: 319.384 meters
Northing: 771,555.597 Easting: 2,282,488.617 Ortho H: 1,047.846 US Survey FT

UTM Zone 14 meters

Northing: 3,924,757.450 Easting: 686,426.385

UTM Zone 15 meters

Northing: 3,929,978.731 Easting: 141,816.381

Description: grass, on the south shoulder of EW 108 Rd & north of a fence line

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: P-09 GPSID: 11116I USGS Quad: SHAWNEE NE

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°24'20.32691" N Longitude: 96°49'52.40783" W Ellip H: 281.773 meters

Oklahoma South Zone State Plane Coordinates

Northing: 230,493.841 Easting: 706,167.888 Ortho H: 309.177 meters
Northing: 756,211.878 Easting: 2,316,819.145 Ortho H: 1,014.358 US Survey FT

UTM Zone 14 meters

Northing: 3,920,189.262 Easting: 696,938.320

UTM Zone 15 meters

Northing: 3,924,775.130 Easting: 152,042.648

Description: grass, on the north shoulder of EW 111 Rd & south of a low brush area

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: P-10 GPSID: 11116J USGS Quad: PRAGUE

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°28'37.65646" N Longitude: 96°40'10.50991" W Ellip H: 285.388 meters

Oklahoma South Zone State Plane Coordinates

Northing: 238,605.954 Easting: 720,745.274 Ortho H: 313.161 meters

Northing: 782,826.369 Easting: 2,364,645.121 Ortho H: 1,027.429 US Survey FT

UTM Zone 14 meters

Northing: 3,928,453.028 Easting: 711,431.547

UTM Zone 15 meters

Northing: 3,932,150.197 Easting: 167,024.682

Description: bare ground, on the south shoulder of E 1060 Rd & north of a fence line & a utility pole

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: P-11 GPSID: 11116K USGS Quad: EARLSBORO

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°18'42.36141" N Longitude: 96°45'34.78813" W Ellip H: 269.984 meters

Oklahoma South Zone State Plane Coordinates

Northing: 220,156.272	Easting: 712,795.933	Ortho H: 297.301 meters
Northing: 722,296.035	Easting: 2,338,564.657	Ortho H: 975.395 US Survey FT

UTM Zone 14 meters

Northing: 3,909,920.089 Easting: 703,673.355

UTM Zone 15 meters

Northing: 3,914,106.277 Easting: 158,148.827

Description: grass, on the northeast shoulder of Hwy 3E & northwest of the intersection with NS 3510 Rd

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: P-12 GPSID: 11116L USGS Quad: SEMINOLE

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°13'03.78649" N Longitude: 96°39'12.42418" W Ellip H: 246.018 meters

Oklahoma South Zone State Plane Coordinates

Northing: 209,846.639 Easting: 722,593.486 Ortho H: 273.371 meters

Northing: 688,471.849 Easting: 2,370,708.797 Ortho H: 896.885 US Survey FT

UTM Zone 14 meters

Northing: 3,899,710.636 Easting: 713,577.912

UTM Zone 15 meters

Northing: 3,903,307.270 Easting: 167,425.943

Description: sparse grass, on the west shoulder of NS 3570 Rd & north of Park Heights Rd, just south of a drive apron

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: P-13 GPSID: 11116M USGS Quad: PRAGUE SW

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°18'16.66992" N Longitude: 96°39'27.50432" W Ellip H: 284.557 meters

Oklahoma South Zone State Plane Coordinates

Northing: 219,483.253 Easting: 722,083.910 Ortho H: 312.059 meters
Northing: 720,087.972 Easting: 2,369,036.962 Ortho H: 1,023.814 US Survey FT

UTM Zone 14 meters

Northing: 3,909,342.974 Easting: 712,968.897

UTM Zone 15 meters

Northing: 3,912,966.556 Easting: 167,400.402

Description: grass, on the north shoulder of EW 118 Rd & south of a fence intersection

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: P-14 GPSID: 11116N USGS Quad: SEMINOLE

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°07'50.32784" N Longitude: 96°39'06.83204" W Ellip H: 232.847 meters

Oklahoma South Zone State Plane Coordinates

Northing: 200,189.416 Easting: 722,863.910 Ortho H: 260.024 meters

Northing: 656,788.110 Easting: 2,371,596.010 Ortho H: 853.095 US Survey FT

UTM Zone 14 meters

Northing: 3,890,055.015 Easting: 713,947.485

UTM Zone 15 meters

Northing: 3,893,639.204 Easting: 167,212.135

Description: bare ground, in the center of a Y intersection of NS 357 & EW 130 Rd

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: P-15 GPSID: 111160 USGS Quad: EARLSBORO

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°15'36.65179" N Longitude: 96°48'58.33814" W Ellip H: 258.215 meters

Oklahoma South Zone State Plane Coordinates

Northing: 214,371.609 Easting: 707,721.407 Ortho H: 285.334 meters

Northing: 703,317.522 Easting: 2,321,915.982 Ortho H: 936.133 US Survey FT

UTM Zone 14 meters

Northing: 3,904,082.944 Easting: 698,658.250

UTM Zone 15 meters

Northing: 3,908,577.914 Easting: 152,784.592

Description: grass, on the north shoulder of Hwy 270 & west of a dirt drive to the south

McIntosh & Pottawatomie, OK LiDAR Control



Station Name: P-16 GPSID: 11116P USGS Quad: SHAWNEE RESERVOIR

NAD 1983 NSRS2007/ NAVD 1988 Ortho Heights

Latitude: 35°17'59.30743" N Longitude: 97°07'29.32334" W Ellip H: 321.196 meters

Oklahoma South Zone State Plane Coordinates

Northing: 218,481.473 Easting: 679,601.906 Ortho H: 348.010 meters
Northing: 716,801.301 Easting: 2,229,660.585 Ortho H: 1,141.763 US Survey FT

UTM Zone 14 meters

Northing: 3,907,903.992 Easting: 670,497.730

UTM Zone 15 meters

Northing: 3,914,102.105 Easting: 124,873.686

Description: bare ground, sandy area north of a dirt road and on the west side of NS 330 Rd