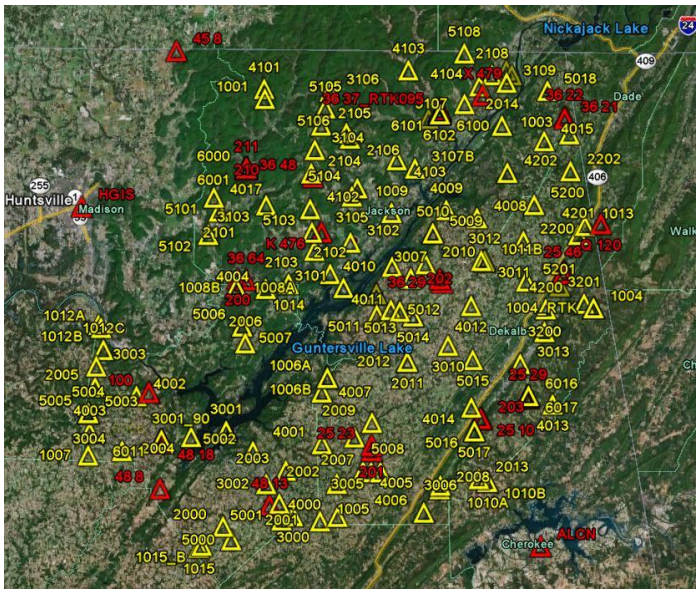
LiDAR GROUND CONTROL SURVEY REPORT



US Army Corps of Engineers®

AIRBORNE LIDAR SURVEY
JACKSON, MARSHALL AND DEKALB COUNTIES, AL

US ARMY CORPS OF ENGINEERS—MOBILE, ALABAMA

May 2012

WOOLPERT

DESIGN | GEOSPATIAL | INFRASTRUCTURE

QUALITY

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SECTION 1: SURVEY REPORT

INTRODUCTION

Report Date:	May 2012
Project Name:	Airborne LiDAR Survey, Jackson, Marshall and DeKalb Counties, AL
Client Information:	US Army Corps of Engineers, Mobile District P.O. Box 2288 Mobile, Alabama 36628-0001 Phone: 251.441.5665
Contract Number:	W91278-10-D-0101
Requisition/Reference Number:	W31XNJ12719359/C-11-29
Date of Contract:	30 Sept. 2011
Delivery Date:	01 Sept. 2012
Prepared By:	Woolpert, Inc. Shane Lyons, Phase Manager 4454 Idea Center Blvd. Dayton, Ohio 45430 Phone: 937.461.5660 Fax: 937.461.0743 Shane.Lyons@woolpert.com
Woolpert Project Number:	071899

This report contains a comprehensive outline of the LiDAR Ground Control Survey that supported the Airborne LiDAR Survey for Jackson, Marshall, and DeKalb counties, AL. All surveys were performed in such a way as to achieve ground control accuracies that meet or exceed the National Mapping Accuracy Standards.

PROJECT AREA

The project area for this report includes all of Jackson, Marshall and DeKalb counties in Alabama, including a 100' buffer zone outside the outer edge of the county boundaries. The other two counties (Clay and Cleburne) will be a separate task order and will be covered in a separate report.

PURPOSE

The purpose of this survey was to establish three-dimensional coordinates for 23 ground control points (GCPs) and a minimum of 20 quality control points (QCPs) in each of the land cover classifications within the project area.

The GCPs were located on open, bare earth surfaces with a level slope to enable effective assessment of swath-to-swath reproducibility and absolute accuracy. The QCPs were collected uniformly dispersed over the project area in the appropriate land cover categories to verify fundamental, supplemental, and consolidated vertical accuracies throughout the task order AOI.

DATE OF SURVEY

Ground control field operations took place between March 28, 2012, and April 05, 2012

MONUMENTATION

Prior to aerial imagery acquisition, Woolpert field crews performed a field reconnaissance to verify the existence and suitability of pre-selected existing National Geodetic Survey (NGS) control stations. These existing control stations were utilized to ensure that quality *x, y,* and *z* coordinate values were computed for each of the newly established photogrammetric control stations. Recovery information sheets for the existing NGS control stations can be found in Section 4 of this report. A control diagram showing the ground control stations used to support this LiDAR mapping project can be found in Section 5 of this report.

ACCURACY

The data collected under this task order shall meet the National Standard for spatial Database Accuracy (NSSDA) standards. The NSSDA standards specify that vertical accuracy be reported at the 95 percent confidence level for data tested by an independent source of higher accuracy.

The overall accuracy of the ground control survey is expressed in terms of standard deviation, at a 95% confidence level, based on the published NGS control monuments that were used throughout the task order AOI. The standard deviation of the ground control survey is 0.045' horizontally and 0.048' vertically at the 95% confidence level.

GPS EQUIPMENT

Woolpert utilized Trimble Navigation dual-frequency GPS receivers with Air Link Communications Raven CDMA cellular modems with service plans provided by Verizon as a base station. Additionally, Woolpert utilized Trimble Navigation R8 series GNSS dual-frequency GPS receivers with Air Link Communications Raven CDMA cellular modems and TSC2 data collectors as rovers for this project.

METHODOLOGY

REAL-TIME KINEMATIC (RTK) GPS

The field crew utilized Real-Time Kinematic (RTK) GPS surveying throughout most of the ground control data collection process. The survey was conducted using a 1-second epoch rate, in a fixed solution RTK mode, with each observation lasting between 60 to 180 seconds. Each station was occupied twice to insure the necessary horizontal and vertical accuracies were being met for this photogrammetric project.

RAPID-STATIC GPS

In addition to the RTK GPS techniques, the project field crew utilized rapid-static (RS) GPS surveying techniques on those check points within areas lacking sufficient cellular coverage for RTK measurements.

GPS DATA ANALYSIS AND PROCESSING

The field crew chief processed all session baselines each day using *Trimble Navigation's* Trimble Business Center (TBC) Version 2.70 baseline processor with the accompanying broadcast ephemeris. Daily processing ensured the integrity of the network as it was constructed, and allowed the field crews to immediately reschedule observations of poor baselines. Once the field work was complete, the processed baselines were then run through a rigorous loop closure analysis. As a result of this analysis, unacceptable GPS vectors were removed and field blunders, if any, were detected and eliminated. Once this process was completed, both unconstrained and constrained adjustments were conducted in order to effectively incorporate the static observation data.

The GPS control and base stations consisted of the following:

Dimension	New and Existing Control Stations
3-D	25 10, 36 36, 36 64, 48 13, and 48 8,
2-D	25 23, 25 46, 36 21, 36 29, 36 47, and 36 48,
Vertical	K 476, Q 120, and X 479

DATUM REFERENCE AND FINAL COORDINATES

New horizontal GPS control within the Project area was based on the Alabama East State Plane Coordinate System, referenced to North American Datum 1983, national re-adjustment of 2007 (NAD83/2007), expressed in US Survey Feet. All vertical control was based on the North American Vertical Datum of 1988 (NAVD88), also expressed in US Survey Feet. The coordinates for the ground control survey can be found in Section 2 of this report.

QUALITY ASSURANCE

Existing NGS published control stations were surveyed to assure that there were no discrepancies in the field observation data. Close examinations of the residuals showed no distortions in orientation or scale.

SECTION 2: GEODETIC /GROUND CONTROL COORDINATE LISTINGS

COORDINATE SYSTEM: GRID

HORIZONTAL DATUM: NAD83 (2007)
VERTICAL DATUM: NAVD88
ZONE: State Plane, Alabama East
GEOID MODEL: GEOID 09
UNITS: US Survey Feet

CONTROL BASE STATIONS

Station Name	Northing (US Ft.)	Easting (US Ft.)	Elevation (US Ft.)	Description
100	1426406.87	470557.39	1052.22	TSM - ADJUSTED
25 10	1410146.836	672573.395	897.439	EE2309
25 23	1394022.319	606197.900	1113.787	AA2951
25 46	1497736.031	722817.391	951.135	AA2974
36 36	1595084.434	648358.001	605.875	AA3012
36 29	1492573.619	649384.672	1440.686	AA3005
36 36	1595084.434	648358.001	605.875	AA3012
36 47	1586114.518	575742.609	1700.911	AA3022
36 48	1556615.938	570822.518	1567.603	AA3023
36 64	1494419.378	529909.307	610.967	AA3039
48 13	1358000.468	543976.345	1060.730	AA3052
48 8	1368085.277	477261.565	659.464	AA3047
ALCN	1332683.27	709019.51	640.47	DM3491 (CORS)
HGIS	1539128.30	429800.13	677.37	DK7412 (CORS)
K 476	1523229.55	575936.07	654.44	EF1323
Q 120	1527835.72	746000.42	832.61	EE0971
X 479	1605870.94	674127.38	623.56	EE1500

NGS CONTROL CHECK POINTS

Station Name	Northing (US Ft.)	Easting (US Ft.)	Elevation (US Ft.)	Description
25 10	12482010.92	2008736.74	897.44	EE2309
25 23	12465128.65	1942566.25	1113.79	AA2951
25 46	12570157.45	2057958.08	951.14	AA2974
36 21	12663989.22	2058129.49	1490.86	AA2997
36 29	12564147.19	1984604.28	1440.69	AA3005
36 36	12666616.10	1982388.52	605.88	AA3012
36 47	12656803.88	1909900.99	1700.91	AA3022
36 48	12627258.55	1905325.51	1567.60	AA3023
36 64	12564611.05	1865148.11	610.97	AA3039

Station Name	Northing (US Ft.)	Easting (US Ft.)	Elevation (US Ft.)	Description
48 13	12428405.92	1880779.45	1060.73	AA3052
48 8	12437722.48	1813975.90	659.46	AA3047
K 476	12593943.26	1910824.47	654.44	EF1323
Q 120	12600518.86	2080787.39	832.61	EE0971
X 479	12677699.71	2008024.94	623.56	EE1500

WOOLPERT TSM (TEMPORARY SURVEY MARK) CONTROL

Station Name	Northing (US Ft.)	Easting (US Ft.)	Elevation (US Ft.)	Description
200	1495178.20	524752.37	603.46	RTK CHECK POINT
201	1390758.68	606106.98	1120.86	RTK CHECK POINT
202	1494757.47	647909.42	1410.89	RTK CHECK POINT
203	1409837.29	673321.76	860.94	RTK CHECK POINT
210	1560839.69	530394.82	624.93	TOTAL STATION CONTROL
211	1562068.34	530439.39	627.34	TOTAL STATION CONTROL

LiDARGROUND CONTROL

Station Name	Northing (US Ft.)	Easting (US Ft.)	Elevation (US Ft.)	Description
1001	1604098.02	541671.09	671.46	CONCRETE CORNER
1002	1618125.02	692029.97	661.74	PID
1003	1582206.43	726942.84	1382.38	CONCRETE PAD
1004	1476919.52	741418.31	1652.10	COMPACTED GRAVEL
1005	1348226.93	574685.46	1065.58	COMPACTED GRAVEL
1006A	1435195.91	579304.76	1149.88	GRAVEL
1006B	1435051.41	579331.98	1158.58	OLD PAINTED L
1007	1388370.21	433381.87	1082.99	FADED STOP BAR
1008A	1489653.28	523909.75	618.12	SHORT GRASS
1008B	1489663.94	523937.84	618.54	CONCRETE CORNER
1009	1534884.34	618642.47	634.96	CONCRETE CORNER
1010A	1371929.82	676497.31	1141.90	CONCRETE CORNER
1010B	1371906.19	676541.28	1140.14	CONCRETE CORNER
1011A	1505415.50	675304.33	1454.11	CONCRETE CORNER
1011B	1505256.40	674915.87	1456.79	LIGHT ASPHALT
1012A	1465635.13	441492.59	568.59	LIGHT ASPHALT
1012B	1467453.64	439886.81	563.07	DIRT
1012C	1452269.46	442860.32	601.98	PLOWED FIELD
1013	1526721.90	736307.15	877.97	CONCRETE CORNER
1014	1491953.81	555836.87	1323.82	PID
1015	1332358.00	500716.46	916.40	CONCRETE CORNER
1015_B	1333578.28	502553.99	920.57	STOP BAR

QUALITY CONTROL POINTS

Station Name	Northing (US Ft.)	Easting (US Ft.)	Elevation (US Ft.)	Description
2000	1345144.61	515555.94	970.88	BARE EARTH/SHORT GRASS
2001	1348837.27	551243.53	1013.01	BARE EARTH/SHORT GRASS
2002	1370978.60	584918.34	1120.14	BARE EARTH/SHORT GRASS
2003	1378981.85	553953.84	989.18	BARE EARTH/GRAVEL
2004	1399447.08	496272.70	640.81	BARE EARTH/GRAVEL
2005	1429815.75	437778.74	914.60	BARE EARTH/SHORT GRASS
2006	1456118.80	529383.61	1215.10	BARE EARTH/SHORT GRASS
2007	1377958.60	605850.98	1129.85	BARE EARTH/DIRT
2008	1367570.24	647525.55	719.06	BARE EARTH/SHORT GRASS
2009	1407838.87	606492.55	1170.50	BARE EARTH/LOW GRASS
2010	1503784.31	639312.29	1405.68	BARE EARTH/SHORT GRASS
2011	1444438.75	628142.08	1272.25	BARE EARTH/SHORT GRASS
2012	1444825.29	627992.97	1269.25	BARE EARTH/SHORT GRASS
2013	1373679.17	671402.47	1222.78	BARE EARTH/SHORT GRASS
2014	1587457.84	685955.07	1523.51	BARE EARTH/GRAVEL
2101	1535984.72	513536.64	603.13	BARE EARTH/SHORT GRASS
2102	1497943.24	581184.55	617.52	BARE EARTH/GRAVEL/GRASS
2103	1512093.09	571579.54	615.76	BARE EARTH/GRAVEL
2104	1558863.28	569833.07	1584.57	BARE EARTH
2105	1587823.34	575990.21	1704.87	BARE EARTH/SHORT GRASS
2106	1579899.26	593394.70	1685.69	BARE EARTH/LOW GRASS
2107	1591816.11	641276.84	633.51	BARE EARTH/LOW GRASS
2108	1618161.09	679969.20	677.88	BARE EARTH
2200	1517629.19	698830.32	1553.30	BARE EARTH/SHORT GRASS
2201	1490165.44	720821.10	999.61	BARE EARTH/SHORT GRASS
2202	1559853.87	727563.47	1614.21	BARE EARTH/SHORT GRASS
3000	1351384.01	558156.59	1040.68	URBAN CONCETE
3001	1403079.84	517605.70	599.61	URBAN CONCETE
3001_90	1403079.79	517605.67	599.68	URBAN CONCETE
3002	1370863.22	541938.71	1053.65	URBAN CONCETE
3003	1442271.49	438510.26	1201.39	URBAN/VERY LIGHT ASPHALT
3004	1391028.44	454127.07	1100.39	URBAN CONCETE
3005	1377861.33	611503.49	1131.64	URBAN CONCETE
3006	1369753.03	647974.96	712.69	URBAN/VERY LIGHT ASPHALT
3007	1495054.49	630237.57	1368.36	URBAN CONCETE
3008	1485690.06	609254.24	1344.78	URBAN CONCETE
3009	1485648.10	609280.10	1345.55	URBAN CONCETE
3010	1454376.60	652804.31	1313.12	URBAN CONCETE
3011	1505702.45	673122.13	1451.77	URBAN CONCETE
3012	1505935.40	675333.83	1457.45	URBAN CONCETE
3013	1443238.57	696723.80	915.19	URBAN CONCETE

Station Name	Northing (US Ft.)	Easting (US Ft.)	Elevation (US Ft.)	Description
3101	1489485.33	589281.22	617.50	URBAN CONCETE
3102	1516930.96	593555.33	621.42	URBAN CONCETE
3103	1539652.18	542311.75	1557.14	URBAN CONCETE
3104	1573049.65	572039.89	1662.03	URBAN/CONCRETE
3105	1544947.97	594503.99	630.85	URBAN /CONCRETE
3106	1608426.26	581182.22	1774.50	URBAN/CONC
3107	1596210.13	647680.56	625.54	URBAN
3107B	1561670.86	632969.86	609.92	URBAN
3108	1620831.99	688754.47	666.69	URBAN/CONCRETE
3109	1613566.85	688861.24	705.41	URBAN/CONCRETE
3200	1462570.37	711508.53	970.45	URBAN
3201	1479641.41	735636.04	1675.61	URBAN CONC PAD
4000	1350940.71	585305.27	1088.90	TALL GRASS
4001	1394972.78	575906.85	1096.46	TALL GRASS
4002	1424293.57	462999.65	1041.26	TALL GRASS
4003	1402339.03	434313.33	953.13	TALL GRASS
4004	1489057.92	541876.32	695.54	TALL GRASS
4005	1378471.90	600925.28	1119.40	TALL GRASS
4006	1353353.49	637848.81	786.01	TALL GRASS
4007	1426249.87	575921.89	1143.44	TALL GRASS
4008	1531500.32	670605.58	1474.47	TALL GRASS
4009	1536469.09	651921.98	1432.92	TALL GRASS
4010	1502236.08	618907.63	1414.33	TALL GRASS
4011	1475042.60	623550.14	1273.99	TALL GRASS
4012	1478458.25	666922.55	1390.78	TALL GRASS
4013	1418629.48	716386.37	1291.56	TALL GRASS
4014	1416908.35	666920.94	750.56	TALL GRASS
4015	1578094.02	711597.41	1355.38	TALL GRASS
4017	1562138.36	530212.91	625.81	TALL GRASS
4101	1610019.84	541279.94	682.69	TALL GRASS
4102	1537225.21	569087.30	632.19	TALL GRASS
4103	1566824.06	621869.34	616.17	TALL GRASS
4103	1621345.50	629059.37	629.62	TALL GRASS
4104	1611452.46	672245.63	609.13	TALL GRASS
4200	1476341.77	712373.73	949.90	TALL GRASS
4201	1521289.45	732259.95	890.56	TALL GRASS
4202	1558929.19	689160.59	1356.15	TALL GRASS
5000	1336880.57	520548.43	913.93	BRUSH/TREES
5001	1358904.81	549894.77	1023.43	BRUSH/TREES
5003	1413685.06	433515.37	752.43	BRUSH/TREES
5004	1413708.80	433518.87	752.35	BRUSH/TREES
5005	1414127.54	433608.50	708.15	BRUSH/TREES
5006	1466322.37	527514.60	1203.34	BRUSH/TREES

Station Name	Northing (US Ft.)	Easting (US Ft.)	Elevation (US Ft.)	Description
5007	1466329.22	527528.88	1203.54	BRUSH/TREES
5008	1399051.12	595825.79	1144.79	BRUSH/TREES
5009	1522390.90	643732.73	1366.93	BRUSH/TREES
5010	1522402.05	643724.23	1366.64	BRUSH/TREES
5013	1472219.64	631595.73	1290.54	BRUSH/TREES
5014	1472237.08	631588.79	1289.04	BRUSH/TREES
5015	1445724.80	667844.69	1265.20	BRUSH/TREES
5016	1402549.29	668749.62	856.26	BRUSH/TREES
5017	1402561.36	668752.69	856.78	BRUSH/TREES
5018	1608624.05	713726.94	1503.90	BRUSH/TREES
5101	1544412.43	510487.56	618.58	BRUSH/TREES
5103	1523085.64	570179.51	621.77	BRUSH/TREES
5105	1598197.21	578434.61	1763.42	BRUSH/TREES
5106	1583196.35	591242.34	1693.27	BRUSH/TREES
5107	1600693.06	663177.82	631.31	BRUSH/TREES
5108	1631397.04	663151.87	669.34	BRUSH/TREES
5200	1539493.01	705434.55	1449.59	BRUSH/TREES
5201	1493156.29	700437.47	1486.18	BRUSH/TREES
6000	1561972.13	530496.21	625.60	FOREST ALONG CEEK
6001	1561953.41	530331.00	624.80	FOREST ALONG CEEK
6002	1561935.09	530218.83	624.72	FOREST ALONG CEEK
6003	1561916.74	530148.98	625.54	FOREST ALONG CEEK
6006	1397248.30	478209.10	1014.62	FOREST
6007	1397319.39	478196.89	1015.09	FOREST
6008	1397408.04	478189.90	1016.10	FOREST
6009	1397486.73	478170.46	1016.92	FOREST
6010	1397559.93	478158.14	1017.53	FOREST
6011	1397684.26	478127.88	1020.46	FOREST
6012	1423089.78	701317.59	1471.74	FOREST
6013	1423071.55	701238.60	1475.41	FOREST
6014	1423081.54	701101.68	1474.56	FOREST
6015	1423168.29	701088.48	1475.58	FOREST
6016	1423861.06	701730.10	1480.90	FOREST
6017	1423827.68	701786.76	1478.57	FOREST
6100	1594574.21	648244.13	603.49	DENSE FOSEST
6101	1594583.65	648130.97	602.41	DENSE FOSEST
6102	1594583.41	648010.62	601.81	DENSE FOSEST
6103	1594593.92	647909.67	601.39	DENSE FOSEST
6104	1594606.62	647822.45	601.49	DENSE FOSEST
6105	1594611.16	647722.82	601.25	DENSE FOSEST

COORDINATE SYSTEM: GEODETIC

HORIZONTAL DATUM: WGS 84
VERTICAL DATUM: NAVD88
GEOID MODEL: GEOID 09
UNITS: US Survey Feet

CONTROL BASE STATIONS

Station Name	Latitude	Longitude	Ellips. Hgt. (US Ft.)	Description
100	N34°25'08.96936"	W86°26'55.55214"	957.44	TSM - ADJUSTED
25 10	N34°22'33.65398"	W85°46'44.25782"	803.078	EE2309
25 23	N34°19'53.78840"	W85°59'55.84299"	1019.061	AA2951
25 46	N34°36'59.40011"	W85°36'42.53090"	856.708	AA2974
36 36	N34°53'03.03802"	W85°51'33.73189"	511.150	AA3012
36 29	N34°36'09.05133"	W85°51'21.13234"	1346.551	AA3005
36 36	N34°53'03.03802"	W85°51'33.73189"	511.150	AA3012
36 47	N34°51'33.26001"	W86°06'05.08342"	1607.106	AA3022
36 48	N34°46'41.34689"	W86°07'03.12102"	1473.540	AA3023
36 64	N34°36'24.71947"	W86°15'10.47843"	516.067	AA3039
48 13	N34°13'55.83046"	W86°12'16.21477"	965.331	AA3052
48 8	N34°15'32.46740"	W86°25'31.47258"	564.488	AA3047
ALCN	N34°09'46.95679"	W85°39'31.02172"	545.55	DM3491 (CORS)
HGIS	N34°43'41.17555"	W86°35'12.06237"	583.10	DK7412 (CORS)
K 476	N34°41'11.24614"	W86°06'00.75734"	559.77	EF1323
Q 120	N34°41'56.54109"	W85°32'04.08294"	737.81	EE0971
X 479	N34°54'49.68727"	W85°46'24.32989"	528.61	EE1500

NGS CONTROL CHECK POINTS

Station Name	Latitude	Longitude	Ellips. Hgt. (US Ft.)	Description
25 10	N34°22'33.65398"	W85°46'44.25782"	803.08	EE2309
25 23	N34°19'53.78840"	W85°59'55.84299"	1019.06	AA2951
25 46	N34°36'59.40011"	W85°36'42.53090"	856.71	AA2974
36 21	N34°52'27.57648"	W85°36'24.91845"	1396.02	AA2997
36 29	N34°36'09.05133"	W85°51'21.13234"	1346.55	AA3005
36 36	N34°53'03.03802"	W85°51'33.73189"	511.15	AA3012
36 47	N34°51'33.26001"	W86°06'05.08342"	1607.11	AA3022
36 48	N34°46'41.34689"	W86°07'03.12102"	1473.54	AA3023
36 64	N34°36'24.71947"	W86°15'10.47843"	516.07	AA3039
48 13	N34°13'55.83046"	W86°12'16.21477"	965.33	AA3052
48 8	N34°15'32.46740"	W86°25'31.47258"	564.49	AA3047

K 476	N34°41'11.24614"	W86°06'00.75734"	559.77	EF1323

Station Name	Latitude	Longitude	Ellips. Hgt. (US Ft.)	Description
Q 120	N34°41'56.54109"	W85°32'04.08294"	737.81	EE0971
X 479	N34°54'49.68727"	W85°46'24.32989"	528.61	EE1500

WOOLPERT TSM (TEMPORARY SURVEY MARK) CONTROL

Station Name	Latitude	Longitude	Ellips. Hgt. (US Ft.)	Description
200	N34°36'32.00883"	W86°16'12.21108"	508.54	RTK DERIVED TSM
201	N34°19'21.50245"	W85°59'56.86365"	1026.12	RTK DERIVED TSM
202	N34°36'30.64985"	W85°51'38.78769"	1316.75	RTK DERIVED TSM
203	N34°22'30.58782"	W85°46'35.33143"	766.59	RTK DERIVED TSM
210	N34°47'21.72553"	W86°15'07.97714"	530.72	RTK DERIVED TSM
211	N34°47'33.88018"	W86°15'07.50413"	533.14	RTK DERIVED TSM

LiDARGROUND CONTROL

Station Name	Latitude	Longitude	Ellips. Hgt. (US Ft.)	Description
1001	N34°54'30.04423"	W86°12'54.75521"	577.50	CONCRETE CORNER
1002	N34°56'50.73613"	W85°42'49.18195"	566.65	PID
1003	N34°50'54.84395"	W85°35'50.80000"	1287.52	CONCRETE PAD
1004	N34°33'33.02959"	W85°33'00.67370"	1557.80	COMPACTED GRAVEL
1005	N34°33'33.02977"	W85°33'00.67550"	1557.75	COMPACTED GRAVEL
1006A	N34°12'20.10352"	W86°06'10.15789"	970.44	GRAVEL
1006B	N34°26'40.52807"	W86°05'17.75661"	1054.93	OLD PAINTED L
1007	N34°26'39.09931"	W86°05'17.42721"	1063.64	FADED STOP BAR
1008A	N34°18'50.28022"	W86°34'15.97319"	989.04	SHORT GRASS
1008B	N34°35'37.32302"	W86°16'22.00391"	523.16	CONCRETE CORNER
1009	N34°35'37.42971"	W86°16'21.66848"	523.59	CONCRETE CORNER
1010A	N34°43'07.35209"	W85°57'29.52516"	540.36	CONCRETE CORNER
1010B	N34°16'15.58001"	W85°45'57.74516"	1047.33	CONCRETE CORNER
1011A	N34°16'15.34595"	W85°45'57.22142"	1045.57	CONCRETE CORNER
1011B	N34°38'16.02759"	W85°46'10.96112"	1359.98	LIGHT ASPHALT
1012A	N34°38'14.45619"	W85°46'15.61142"	1362.66	LIGHT ASPHALT
1012B	N34°31'35.10204"	W86°32'45.76306"	473.95	DIRT
1012C	N34°31'52.97669"	W86°33'05.10823"	468.44	PLOWED FIELD
1013	N34°29'22.99509"	W86°32'28.29908"	507.44	CONCRETE CORNER
1014	N34°41'45.79313"	W85°34'00.21110"	783.24	PID
1015	N34°36'01.28817"	W86°10'00.20208"	1228.91	CONCRETE CORNER
1015_B	N34°09'40.31445"	W86°20'49.89568"	820.93	STOP BAR

QUALITY CONTROL POINTS

Station Name	Latitude	Longitude	Ellips. Hgt. (US Ft.)	Description
2000	N34°11'47.50511"	W86°17'54.00133"	875.37	BARE EARTH/SHORT GRASS
2001	N34°12'25.43979"	W86°10'49.29054"	917.67	BARE EARTH/SHORT GRASS
2002	N34°16'05.42004"	W86°04'08.94808"	1025.14	BARE EARTH/SHORT GRASS
2003	N34°17'23.72501"	W86°10'18.21313"	893.88	BARE EARTH/GRAVEL
2004	N34°20'43.72876"	W86°21'46.93001"	545.59	BARE EARTH/GRAVEL
2005	N34°25'40.54509"	W86°33'27.08440"	820.32	BARE EARTH/SHORT GRASS
2006	N34°30'05.84477"	W86°15'14.85873"	1120.01	BARE EARTH/SHORT GRASS
2007	N34°17'14.87734"	W85°59'59.66591"	1035.06	BARE EARTH/DIRT
2008	N34°15'32.50816"	W85°51'42.95083"	624.38	BARE EARTH/SHORT GRASS
2009	N34°22'10.46828"	W85°59'52.59658"	1075.81	BARE EARTH/LOW GRASS
2010	N34°37'59.90574"	W85°53'21.70169"	1311.50	BARE EARTH/SHORT GRASS
2011	N34°28'12.78763"	W85°55'34.72541"	1177.86	BARE EARTH/SHORT GRASS
2012	N34°28'16.60990"	W85°55'36.51061"	1174.86	BARE EARTH/SHORT GRASS
2013	N34°16'32.91418"	W85°46'58.44356"	1128.23	BARE EARTH/SHORT GRASS
2014	N34°51'47.46500"	W85°44'02.52362"	1428.72	BARE EARTH/GRAVEL
2101	N34°43'15.13843"	W86°18'28.68989"	508.53	BARE EARTH/SHORT GRASS
2102	N34°37'01.25738"	W86°04'57.15875"	522.68	BARE EARTH/GRAVEL/GRASS
2103	N34°39'20.97207"	W86°06'52.55358"	520.97	BARE EARTH/GRAVEL
2104	N34°47'03.54824"	W86°07'15.05973"	1490.55	BARE EARTH
2105	N34°51'50.16892"	W86°06'02.16693"	1611.07	BARE EARTH/SHORT GRASS
2106	N34°50'32.19880"	W86°02'33.10532"	1591.67	BARE EARTH/LOW GRASS
2107	N34°52'30.68357"	W85°52'58.71170"	538.83	BARE EARTH/LOW GRASS
2108	N34°56'51.21162"	W85°45'14.06487"	582.87	BARE EARTH
2200	N34°40'16.60398"	W85°41'29.19769"	1459.04	BARE EARTH/SHORT GRASS
2201	N34°35'44.55694"	W85°37'06.60910"	905.22	BARE EARTH/SHORT GRASS
2202	N34°47'13.73293"	W85°35'43.98899"	1519.38	BARE EARTH/SHORT GRASS
3000	N34°12'50.85792"	W86°09'27.07632"	945.39	URBAN CONCETE
3001	N34°21'20.69073"	W86°17'32.71161"	504.17	URBAN CONCETE
3001_90	N34°21'20.69022"	W86°17'32.71199"	504.24	URBAN CONCETE
3002	N34°16'02.99624"	W86°12'41.05201"	958.26	URBAN CONCETE
3003	N34°27'43.79931"	W86°33'19.41216"	1107.02	URBAN/VERY LIGHT ASPHALT
3004	N34°19'17.99453"	W86°30'08.87942"	1006.06	URBAN CONCETE
3005	N34°17'14.00155"	W85°58'52.29744"	1036.88	URBAN CONCETE
3006	N34°15'54.10221"	W85°51'37.60340"	618.01	URBAN/VERY LIGHT ASPHALT
3007	N34°36'33.48944"	W85°55'10.21241"	1274.12	URBAN CONCETE
3008	N34°35'00.60989"	W85°59'21.08066"	1250.31	URBAN CONCETE
3009	N34°35'00.19523"	W85°59'20.77068"	1251.07	URBAN CONCETE
3010	N34°29'51.21785"	W85°50'40.17309"	1218.82	URBAN CONCETE
3011	N34°38'18.87886"	W85°46'37.07566"	1357.65	URBAN CONCETE
3012	N34°38'21.17011"	W85°46'10.60415"	1363.32	URBAN CONCETE

Station Name	Latitude	Longitude	Ellips. Hgt. (US Ft.)	Description
3013	N34°28'00.77616"	W85°41'55.60529"	820.95	URBAN CONCETE
3101	N34°35'37.78170"	W86°03'20.06009"	522.72	URBAN CONCETE
3102	N34°40'09.35435"	W86°02'29.61299"	526.71	URBAN CONCETE
3103	N34°43'52.62211"	W86°12'44.14078"	1462.82	URBAN CONCETE
3104	N34°49'23.93186"	W86°06'49.07724"	1568.16	URBAN/CONCRETE
3105	N34°44'46.50466"	W86°02'18.93948"	536.33	URBAN /CONCRETE
3106	N34°55'14.08897"	W86°05'00.47766"	1680.61	URBAN/CONC
3107	N34°53'14.17081"	W85°51'41.86738"	530.82	URBAN
3107B	N34°47'32.45339"	W85°54'38.13556"	515.27	URBAN
3108	N34°57'17.54823"	W85°43'28.49436"	571.60	URBAN/CONCRETE
3109	N34°56'05.68625"	W85°43'27.30684"	610.35	URBAN/CONCRETE
3200	N34°31'11.77440"	W85°38'58.60505"	876.19	URBAN
3201	N34°34'00.10866"	W85°34'09.72463"	1581.31	URBAN CONC PAD
4000	N34°12'47.20876"	W86°04'03.78823"	993.85	TALL GRASS
4001	N34°20'02.55431"	W86°05'57.06973"	1001.44	TALL GRASS
4002	N34°24'47.60266"	W86°28'25.60196"	946.61	TALL GRASS
4003	N34°21'08.51791"	W86°34'06.07435"	859.07	TALL GRASS
4004	N34°35'32.15530"	W86°12'47.07269"	600.62	TALL GRASS
4005	N34°17'19.87129"	W86°00'58.38151"	1024.58	TALL GRASS
4006	N34°13'11.82919"	W85°53'38.13928"	691.20	TALL GRASS
4007	N34°25'11.94837"	W86°05'57.86828"	1048.45	TALL GRASS
4008	N34°42'34.07502"	W85°47'07.04672"	1380.29	TALL GRASS
4009	N34°43'23.25515"	W85°50'50.85241"	1338.58	TALL GRASS
4010	N34°37'44.41103"	W85°57'25.86772"	1319.95	TALL GRASS
4011	N34°33'15.47247"	W85°56'29.96301"	1179.68	TALL GRASS
4012	N34°33'49.41362"	W85°47'51.38814"	1296.60	TALL GRASS
4013	N34°23'57.02247"	W85°38'01.34523"	1197.20	TALL GRASS
4014	N34°23'40.56444"	W85°47'51.66672"	656.17	TALL GRASS
4015	N34°50'14.48513"	W85°38'55.01034"	1260.71	TALL GRASS
4017	N34°47'34.56343"	W86°15'10.22321"	531.61	TALL GRASS
4101	N34°55'28.60233"	W86°12'59.72388"	588.74	TALL GRASS
4102	N34°43'29.49648"	W86°07'23.25268"	537.78	TALL GRASS
4103	N34°48'23.32121"	W85°56'51.30369"	521.56	TALL GRASS
4103	N34°57'22.68147"	W85°55'25.66913"	535.18	TALL GRASS
4104	N34°55'44.90600"	W85°46'46.88977"	514.19	TALL GRASS
4200	N34°33'27.98289"	W85°38'47.96099"	855.57	TALL GRASS
4201	N34°40'52.16121"	W85°34'48.84481"	795.92	TALL GRASS
4202	N34°47'05.24406"	W85°43'24.43079"	1261.76	TALL GRASS
5000	N34°10'25.97737"	W86°16'54.13375"	818.41	BRUSH/TREES
5001	N34°14'04.98410"	W86°11'05.76325"	928.07	BRUSH/TREES
5003	N34°23'00.68793"	W86°34'16.57486"	658.30	BRUSH/TREES
5004	N34°23'00.92299"	W86°34'16.53522"	658.22	BRUSH/TREES
5005	N34°23'05.07133"	W86°34'15.50212"	614.02	BRUSH/TREES

Station Name	Latitude	Longitude	Ellips. Hgt. (US Ft.)	Description
5006	N34°31'46.69727"	W86°15'37.70497"	1108.31	BRUSH/TREES
5007	N34°31'46.76565"	W86°15'37.53460"	1108.50	BRUSH/TREES
5008	N34°20'43.34941"	W86°01'59.64064"	1050.00	BRUSH/TREES
5009	N34°41'03.97709"	W85°52'28.89235"	1272.67	BRUSH/TREES
5010	N34°41'04.08727"	W85°52'28.99419"	1272.37	BRUSH/TREES
5013	N34°32'47.62300"	W85°54'53.74285"	1196.27	BRUSH/TREES
5014	N34°32'47.79543"	W85°54'53.82597"	1194.76	BRUSH/TREES
5015	N34°28'25.61435"	W85°47'40.51180"	1170.87	BRUSH/TREES
5016	N34°21'18.51588"	W85°47'29.91494"	761.85	BRUSH/TREES
5017	N34°21'18.63526"	W85°47'29.87835"	762.37	BRUSH/TREES
5018	N34°55'16.42595"	W85°38'28.76105"	1408.94	BRUSH/TREES
5101	N34°44'38.35478"	W86°19'05.70324"	524.03	BRUSH/TREES
5103	N34°41'09.66629"	W86°07'09.68614"	527.12	BRUSH/TREES
5105	N34°53'32.84254"	W86°05'33.15494"	1669.59	BRUSH/TREES
5106	N34°51'04.76603"	W86°02'59.01345"	1599.32	BRUSH/TREES
5107	N34°53'58.51648"	W85°48'35.82545"	536.45	BRUSH/TREES
5108	N34°59'02.21607"	W85°48'36.05100"	574.65	BRUSH/TREES
5200	N34°43'52.77215"	W85°40'09.70054"	1355.22	BRUSH/TREES
5201	N34°36'14.50317"	W85°41'10.38332"	1391.87	BRUSH/TREES
6000	N34°47'32.93088"	W86°15'06.81811"	531.40	FOREST ALONG CEEK
6001	N34°47'32.73891"	W86°15'08.79796"	530.60	FOREST ALONG CEEK
6002	N34°47'32.55308"	W86°15'10.14202"	530.52	FOREST ALONG CEEK
6003	N34°47'32.36865"	W86°15'10.97859"	531.33	FOREST ALONG CEEK
6006	N34°20'20.99450"	W86°25'22.19866"	919.74	FOREST
6007	N34°20'21.69701"	W86°25'22.34915"	920.21	FOREST
6008	N34°20'22.57347"	W86°25'22.43867"	921.23	FOREST
6009	N34°20'23.35081"	W86°25'22.67591"	922.04	FOREST
6010	N34°20'24.07411"	W86°25'22.82792"	922.66	FOREST
6011	N34°20'25.30226"	W86°25'23.19738"	925.59	FOREST
6012	N34°24'41.40060"	W85°41'01.09502"	1377.51	FOREST
6013	N34°24'41.22148"	W85°41'02.03813"	1381.18	FOREST
6014	N34°24'41.32230"	W85°41'03.67219"	1380.32	FOREST
6015	N34°24'42.18061"	W85°41'03.82822"	1381.34	FOREST
6016	N34°24'49.02409"	W85°40'56.15776"	1386.66	FOREST
6017	N34°24'48.69308"	W85°40'55.48206"	1384.34	FOREST
6100	N34°52'57.99093"	W85°51'35.09712"	508.76	DENSE FOSEST
6101	N34°52'58.08404"	W85°51'36.45553"	507.69	DENSE FOSEST
6102	N34°52'58.08134"	W85°51'37.90010"	507.09	DENSE FOSEST
6103	N34°52'58.18504"	W85°51'39.11185"	506.67	DENSE FOSEST
6104	N34°52'58.31036"	W85°51'40.15880"	506.77	DENSE FOSEST
6105	N34°52'58.35499"	W85°51'41.35470"	506.53	DENSE FOSEST

SECTION 3: GEODETIC/ GROUND CONTROL LOGS AND PHOTOS

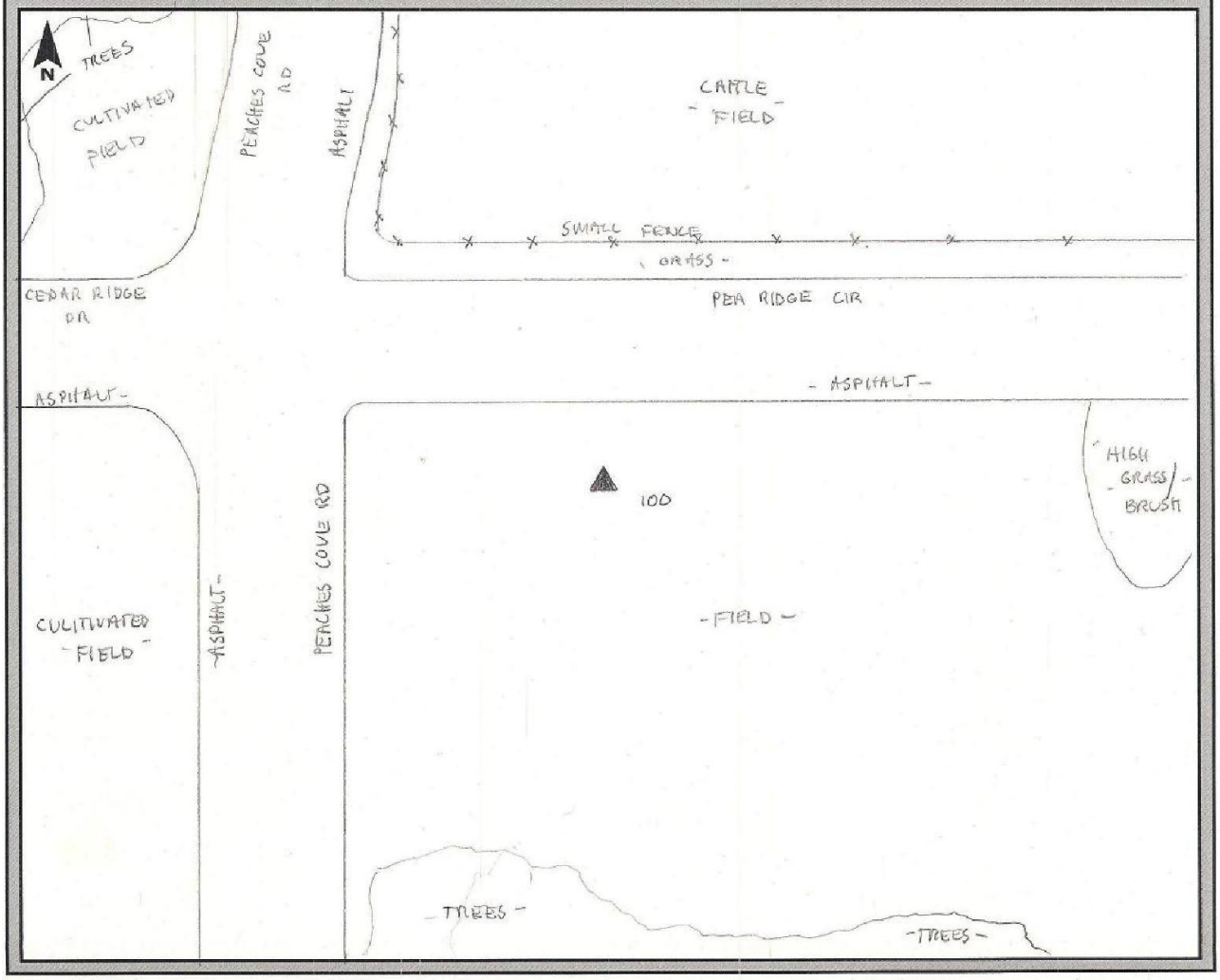
This section contains the station recovery information sheets and photographs for the geodetic control, ground control and checkpoint stations established for the project.

The data is assembled on the following pages.

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:**	71899
Survey Date:	3/30/2012		
Station Name:	100	**Operator Name:**	Cody Schneider
Latitude:	N 34° 25' 09.01"	**Julian Day:**	90
Session No.	N/A		
Longitude:	W86° 26' 55.56"	**Start Time:**	8:41
End Time:	13:30		
Ellip. Height:	295.6 m	**Data File Name:**	21130906
Type of Mark:	TSM	**Type of Reciever:**	R8-2 #2113
Stamping on Mark:	100 SET 2012	**Type of Antenna:**	R8-2 #2113
Weather Condition:	Partly Cloudy & 65°	**Antenna Height:**	2.25 m to bottom of antenna mount

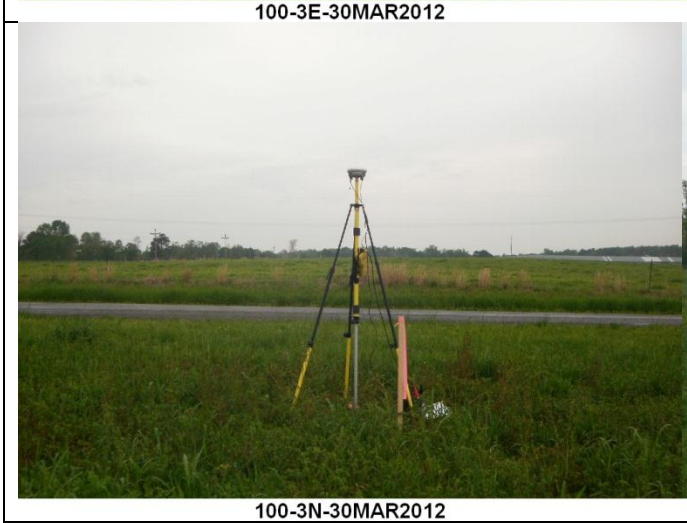


100-1-30MAR2012

100-2-30MAR2012

100-3E-30MAR2012

100-3W-30MAR2012



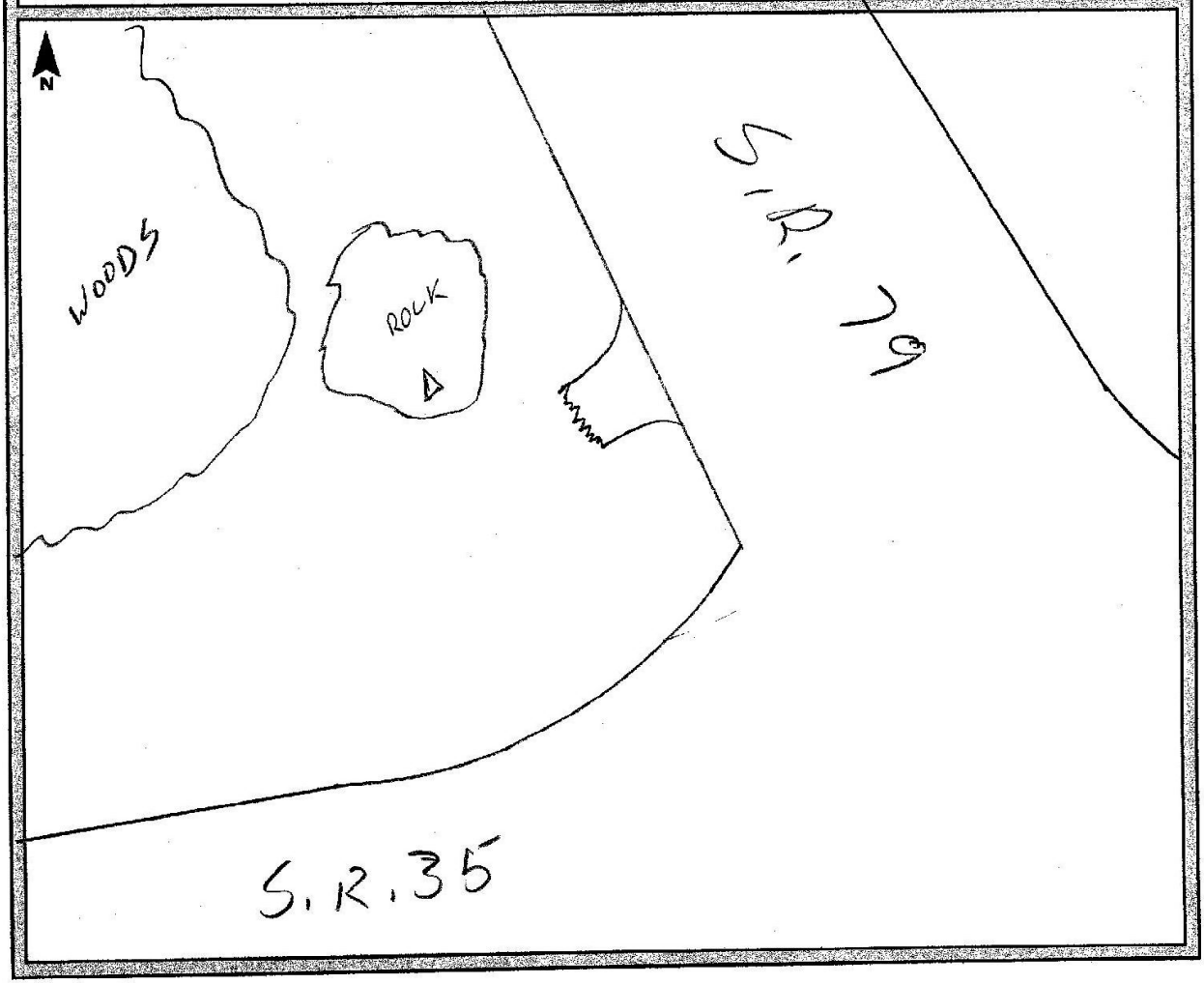
100-3N-30MAR2012

100-3S-30MAR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	Jackson, Marshall and DeKalb Counties, AL	**Project Number:**	71899 **Survey Date:** 3/31/12
Station Name:	K 476	**Operator Name:**	Josh Nave
Latitude:	N34-41-11.246	**Julian Day:**	091 **Session No.** BASE
Longitude:	W86-06-00.755	**Start Time:**	8:32 AM **End Time:** 4:11 PM
Ellip. Height:	559.77FT	**Data File Name:**	K476091A
Type of Mark:	DISK IN BEDROCK	**Type of Reciever:**	Trimble 4000SSI
Stamping on Mark:	K 476 1988	**Type of Antenna:**	Trimble M/C L1/L2
Weather Condition:		**Antenna Height:**	6.562 FT to bottom of antenna mount



K 476-EF1323-1-31MAR2012

K 476-EF1323-3W-31MAR2012

K 476-EF1323-3E-31MAR2012

K 476-EF1323-2-31MAR2012

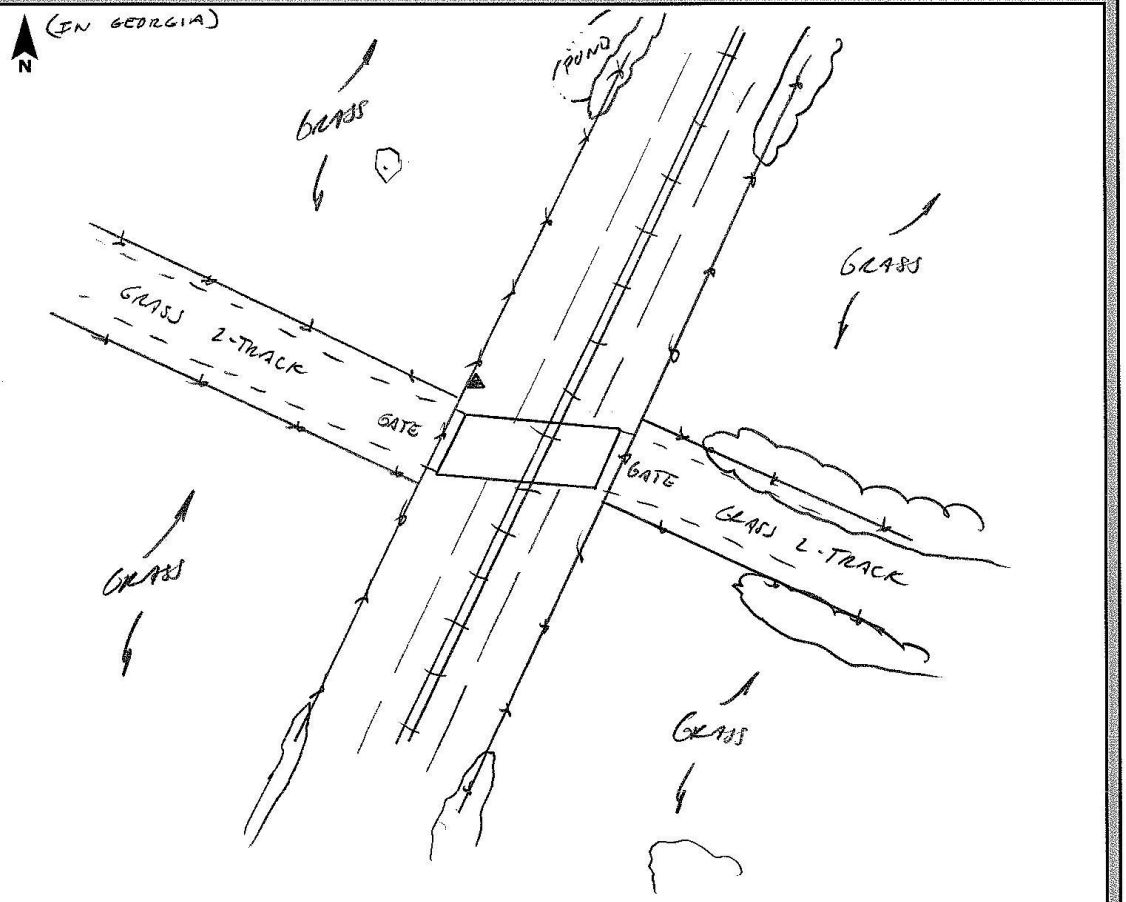
K 476-EF1323-3N-31MAR2012

K 476-EF1323-3S-31MAR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	CIVIL QC NLA - 3 County	Project Number:	71899
Survey Date:	4-3-12		
Station Name:	Q120 (EE0971)	Operator Name:	J SPEELMAN
Latitude:	34° 41' 56.57"	Julian Day:	094
Session No.	1		
Longitude:	85° 32' 04.09"	Start Time:	4:24
End Time:	4:59		
Ellip. Height:	732.059'	Data File Name:	88100
Type of Mark:	BRASS DISK IN CONC.	Type of Reciever:	TRIMBLE R8-2 (4208128810)
Stamping on Mark:	Q120 1994	Type of Antenna:	INTERNAL
Weather Condition:	PC 83°	Antenna Height:	2.0 m to bottom of antenna mount



Q 120-EE0971-BM-1-03APR2012

Q 120-EE0971-BM-2-03APR2012

Q 120-EE0971-BM-3SE-03APR2012

Q 120-EE0971-BM-3NW-03APR2012

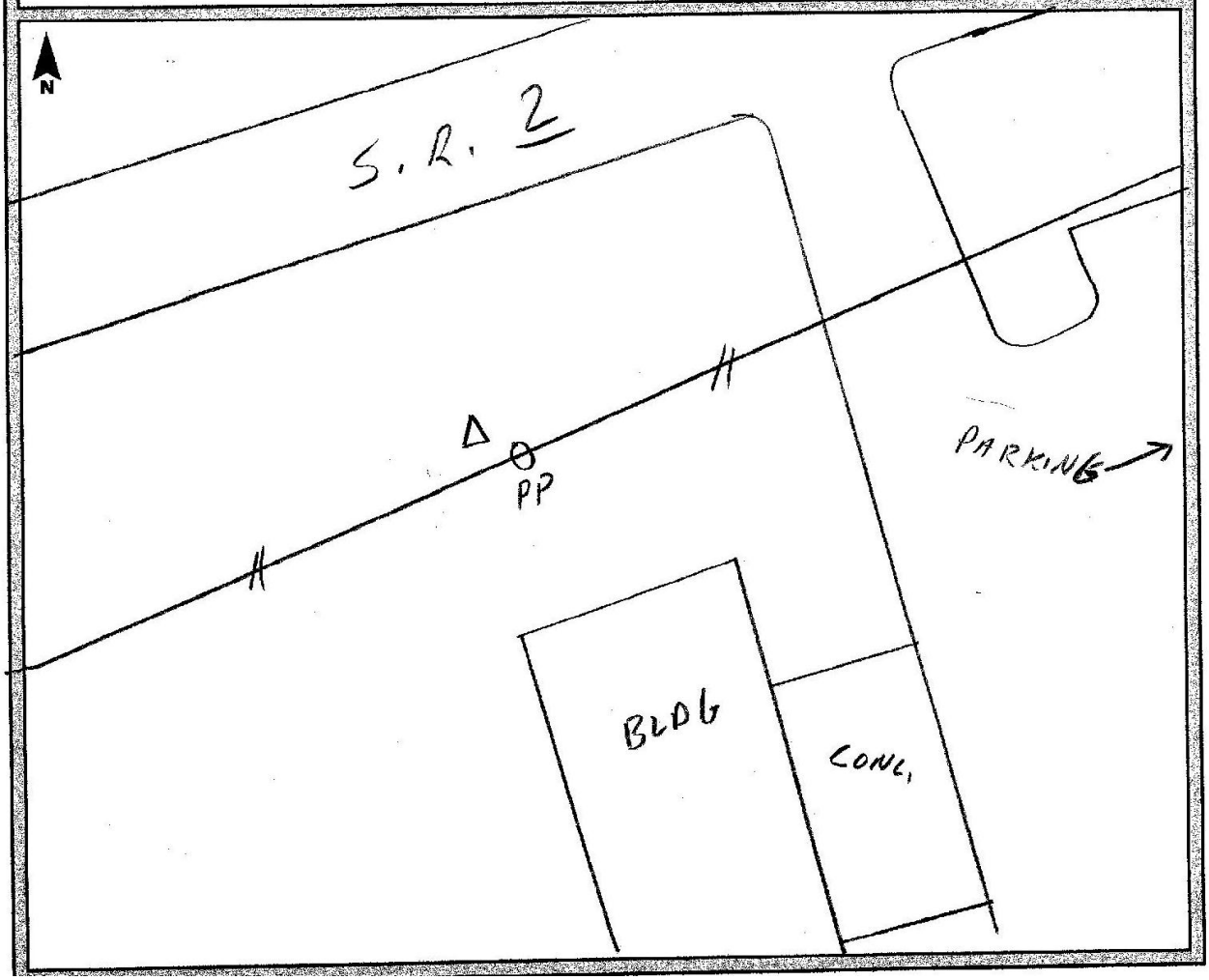
Q 120-EE0971-BM-3NE-03APR2012

Q 120-EE0971-BM-3SW-03APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	Jackson, Marshall and DeKalb Counties, AL	**Project Number:**	71899
Survey Date:	4/3/12		
Station Name:	X 479	**Operator Name:**	Josh Nave
Latitude:	N34-54-49.687	**Julian Day:**	094
Session No.	BASE		
Longitude:	W85-46-24.329	**Start Time:**	8:39AM
End Time:	6:17PM		
Ellip. Height:	528.61 FT	**Data File Name:**	X479094A
Type of Mark:	SS ROD	**Type of Reciever:**	Trimble 4000SSI
Stamping on Mark:	X 479 1983	**Type of Antenna:**	Trimble M/L L1/L2
Weather Condition:		**Antenna Height:**	6.562FT to bottom of antenna mount



X 479-EE1500-1-03APR2012

X 479-EE1500-2-03APR2012

X 479-EE1500-3W-03APR2012

X 479-EE1500-3N-03APR2012

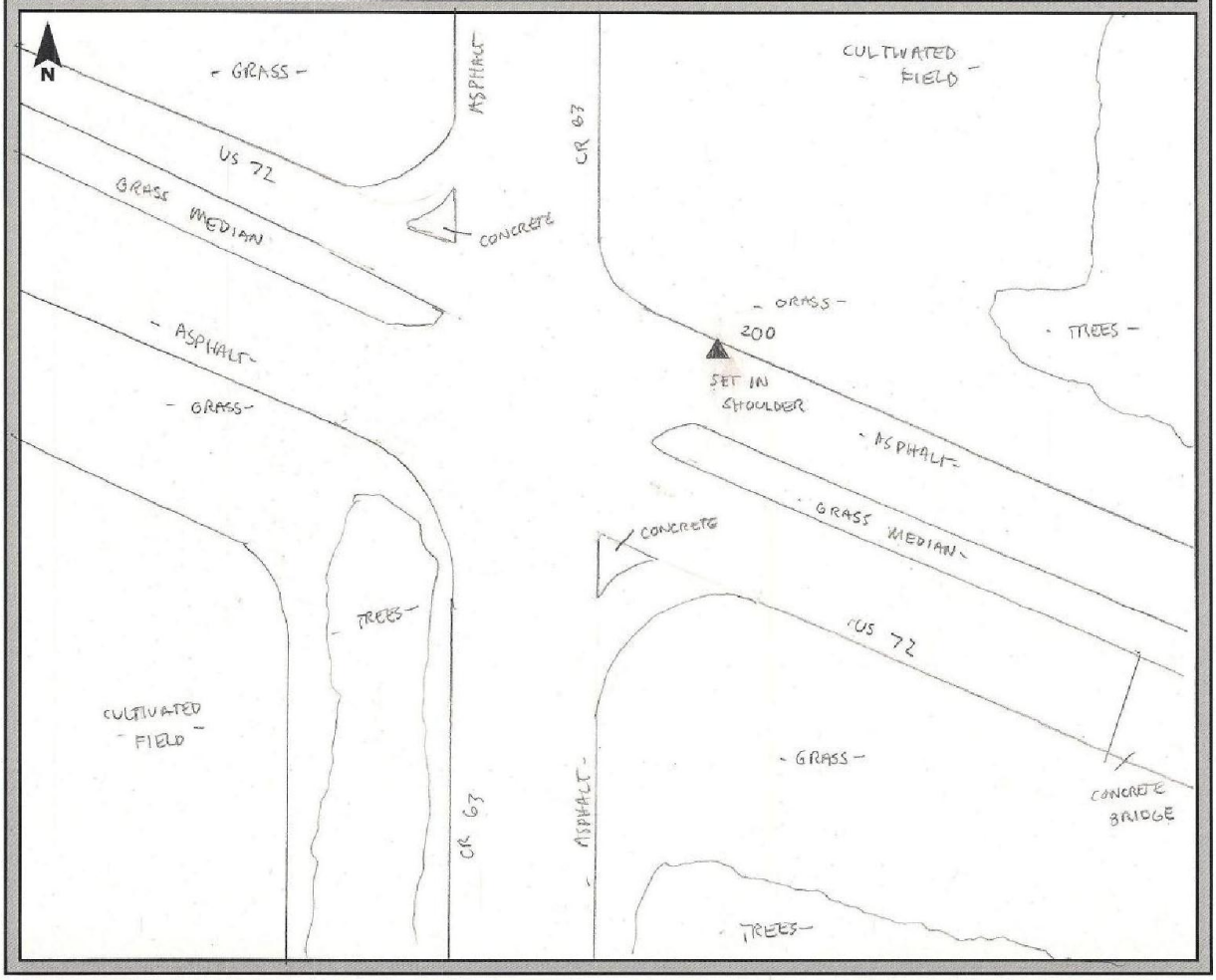
X 479-EE1500-3E-03APR2012

X 479-EE1500-3S-03APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:**	71899
Survey Date:	4/1/2012		
Station Name:	206	**Operator Name:**	Cody Schneider
Latitude:	N 34° 36' 32.01"	**Julian Day:**	92
Session No.	N/A		
Longitude:	W 86° 16' 12.21"	**Start Time:**	8:34
End Time:	8:38		
Ellip. Height:	155.0 m	**Data File Name:**	AL_LIDAR_92_CJS
Type of Mark:	Mag Nail	**Type of Reciever:**	R8-3 #0364
Stamping on Mark:	N/A	**Type of Antenna:**	R8-3 #0364
Weather Condition:	Foggy ≈ 62°	**Antenna Height:**	2.00 m to bottom of antenna mount



200-2-01APR2012

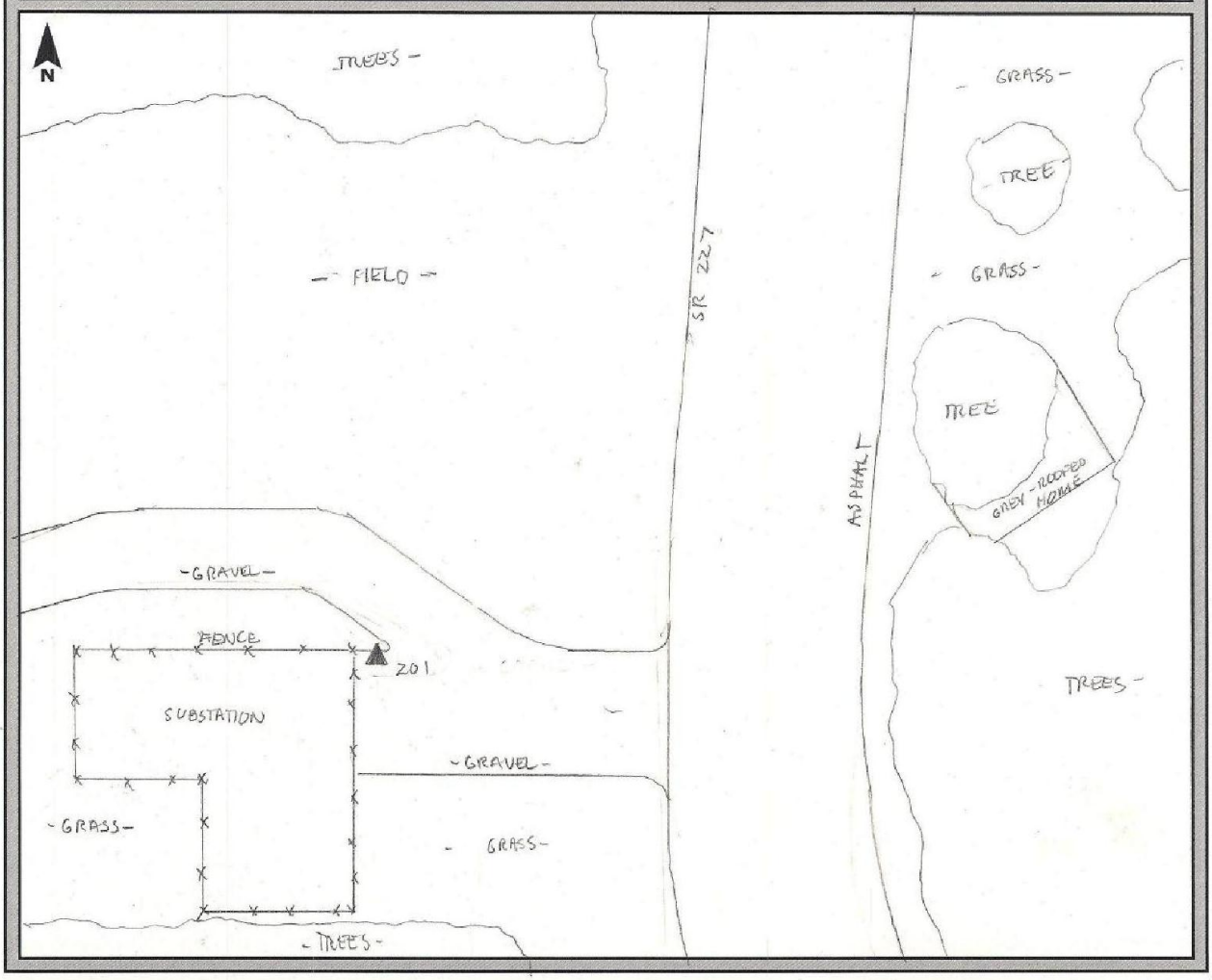
200-3SE-01APR2012

200-3NE-01APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:**	71899	**Survey Date:**	4/1/2012
Station Name:	201	**Operator Name:**	Cody Schneider		
Latitude:	N34° 19' 21.53"	**Julian Day:**	92	**Session No.**	N/A
Longitude:	W85° 59' 56.85"	**Start Time:**	15:29	**End Time:**	15:33
Ellip. Height:	313.6 m	**Data File Name:**	AL_LIDAR_92_CJS		
Type of Mark:	Nail w/ ribbon	**Type of Reciever:**	R8-3 #0364		
Stamping on Mark:	N/A	**Type of Antenna:**	R8-3 #0364		
Weather Condition:	Partly Cloudy ≈ 80°	**Antenna Height:**	2.00 m	to bottom of antenna mount	



201-2-01APR2012

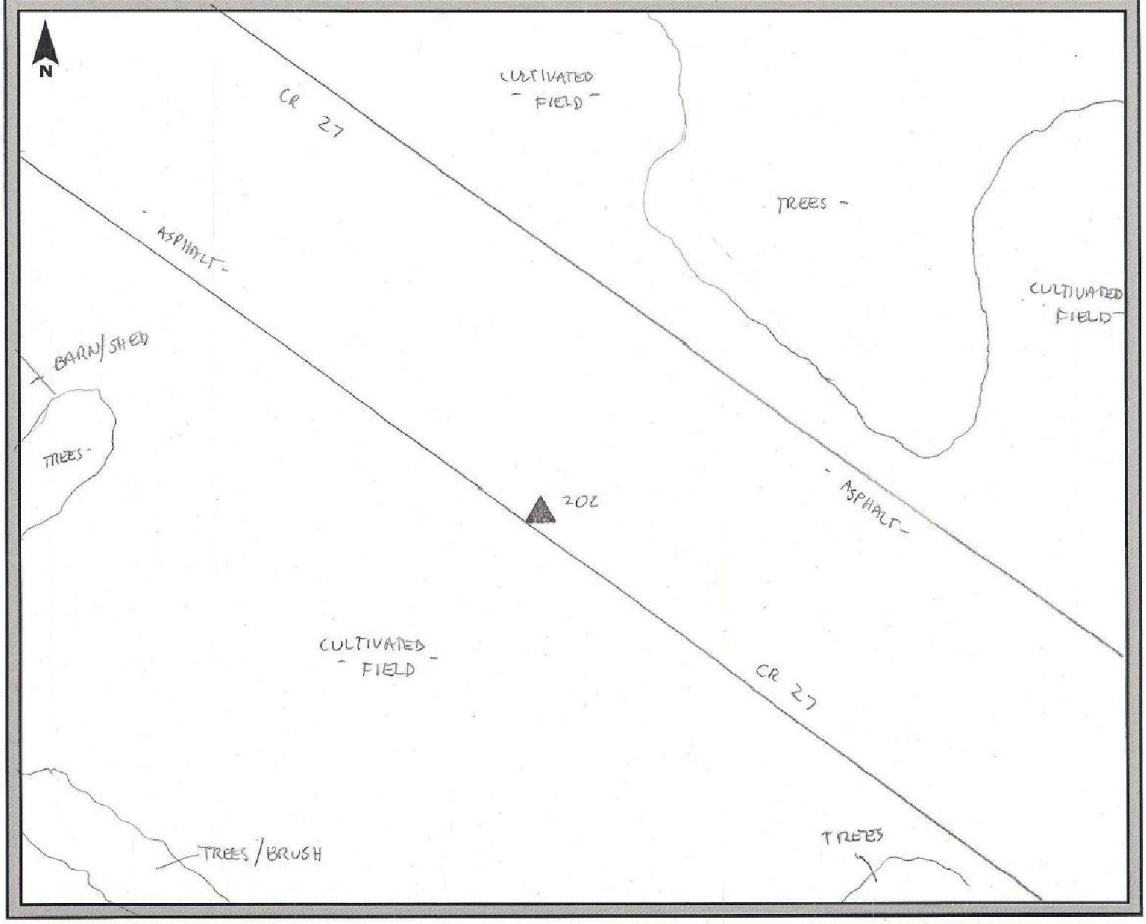
201-3W-01APR2012

201-3N-01APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:**	71899
Survey Date:	4/2/2012		
Station Name:	202	**Operator Name:**	Cody Schneider
Latitude:	N 34° 36' 30.74"	**Julian Day:**	93
Session No.	N/A		
Longitude:	W85° 51' 38.79"	**Start Time:**	16:06
End Time:	16:11		
Ellip. Height:	396.9 m	**Data File Name:**	AL_LIDAR_92_CJS
Type of Mark:	Mag Nail	**Type of Reciever:**	R8-3 #0364
Stamping on Mark:	N/A	**Type of Antenna:**	R8-3 #0364
Weather Condition:	Partly Cloudy ≈82°	**Antenna Height:**	2.00 m to bottom of antenna mount



202-2-02APR2012

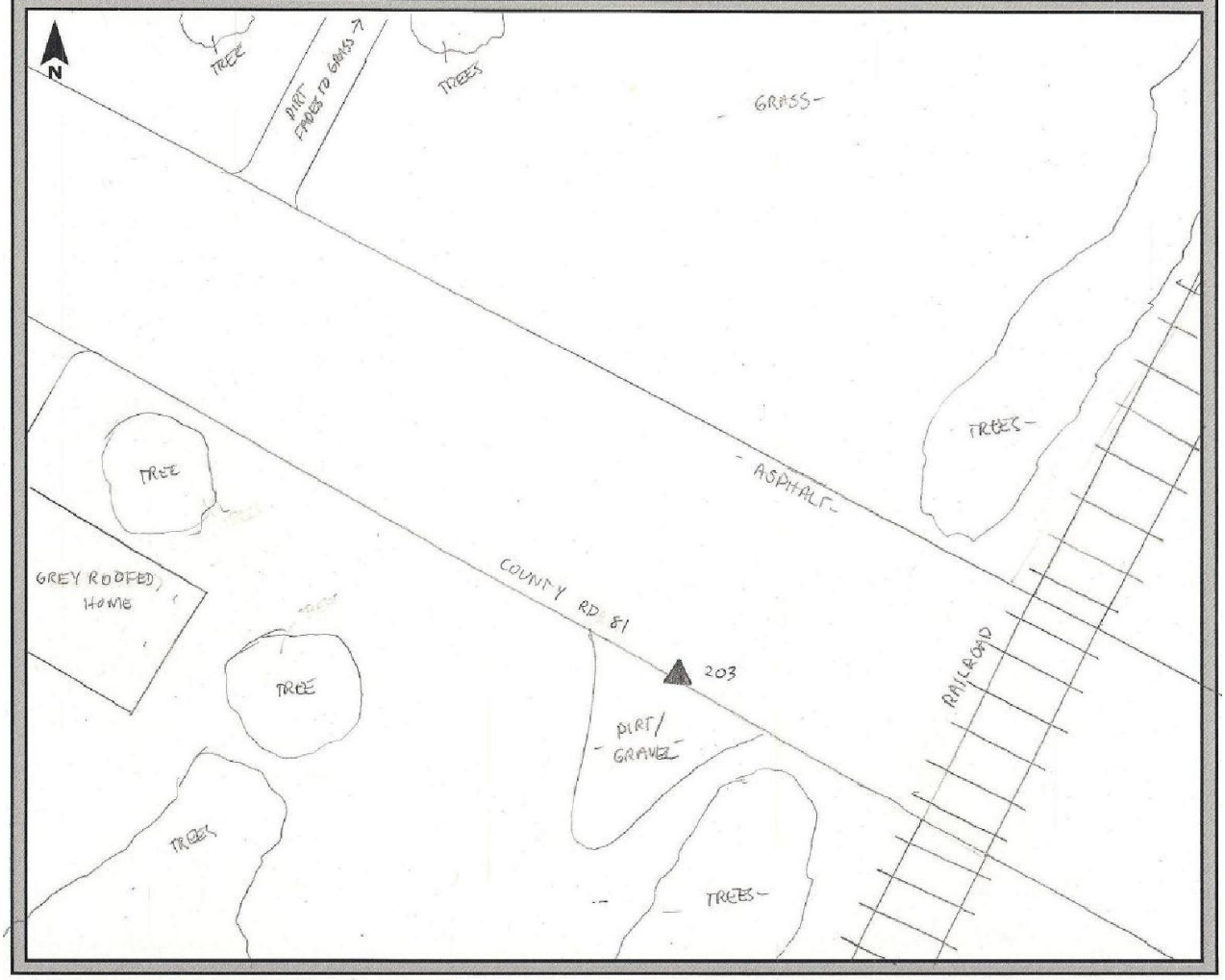
202-3SW-02APR2012

202-3SE-02APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	Project Number: 71894	Survey Date: 4/3/2012
Station Name:	203	Operator Name:	Cody Schneider
Latitude:	N34°22'30.64"	Julian Day: 94	Session No. N/A
Longitude:	W85°46'35.30"	Start Time: 14:52	End Time: 14:56
Ellip. Height:	231.8 m	Data File Name:	AL_LIDAR_94_CJS
Type of Mark:	Mag Nail	Type of Reciever:	RS-3 #0364
Stamping on Mark:	N/A	Type of Antenna:	RE-3 #0364
Weather Condition:	Mostly Cloudy ≈ 80°	Antenna Height:	2.00 m to bottom of antenna mount



203-2-03APR2012

203-3SW-03APR2012

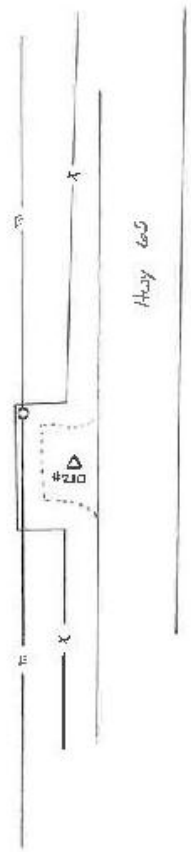
203-3NW-03APR2012

GPS Observation Log Sheet

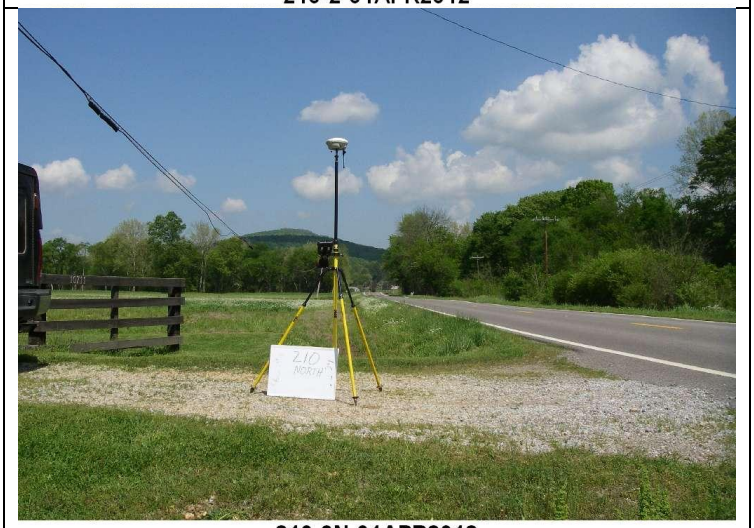
WOOLPERT

Project Name:	Jackson, Marshall and DeKalb Co, AL	**Project Number:**	71899	**Survey Date:**	4/1/12
Station Name:	210	**Operator Name:**	Josh Nave		
Latitude:	N34° 47' 21.7"	**Julian Day:**	092	**Session No.**	RTK
Longitude:	W86° 15' 06.9"	**Start Time:**	RTK	**End Time:**	RTK
Ellip. Height:	530.7	**Data File Name:**			
Type of Mark:	Nail	**Type of Reciever:**	R8-2		
Stamping on Mark:	none	**Type of Antenna:**	R8-2		
Weather Condition:	Sunny	**Antenna Height:**	2.0m	to bottom of antenna mount	

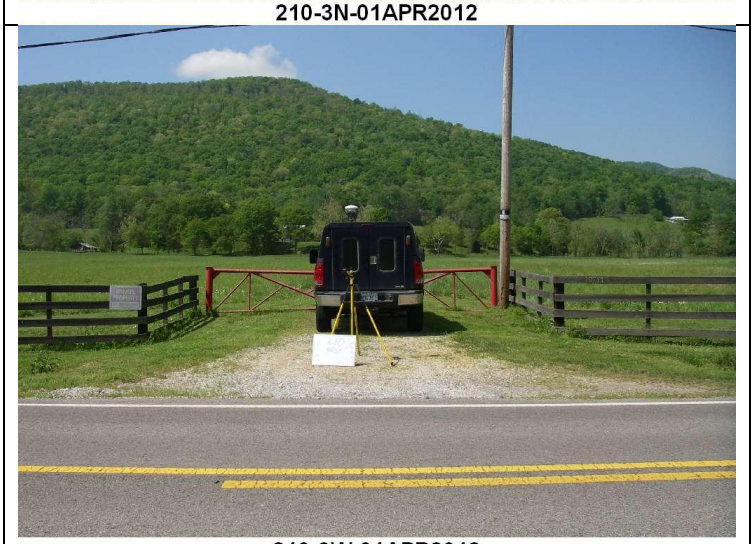
N



210-2-01APR2012



210-3N-01APR2012



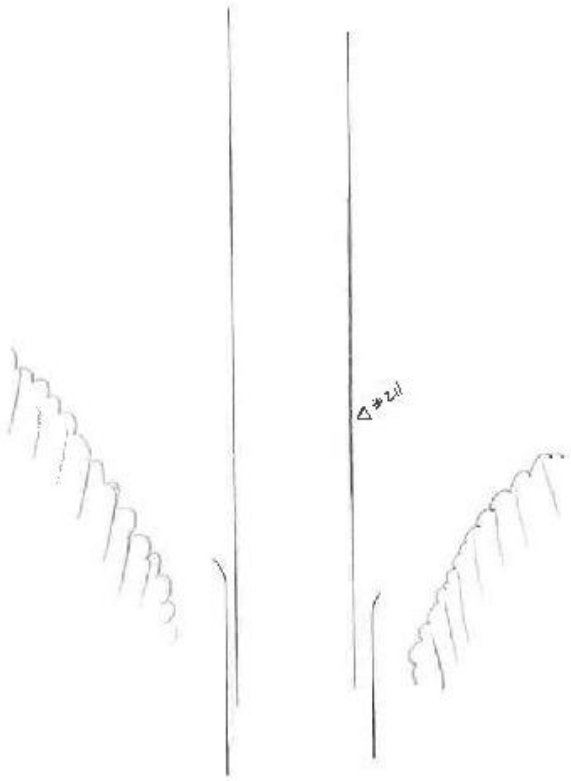
210-3W-01APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	Jackson, Marshall, and DeKalb Co, AL	**Project Number:**	71899	**Survey Date:**	4/1/12
Station Name:	211	**Operator Name:**	Josh Nave		
Latitude:	N 34 47 33.9	**Julian Day:**	092	**Session No.**	RTK
Longitude:	W 86 15 07.5	**Start Time:**	RTK	**End Time:**	RTK
Ellip. Height:	535.1	**Data File Name:**			
Type of Mark:	Nail	**Type of Reciever:**	R8-2		
Stamping on Mark:	None	**Type of Antenna:**	R8-2		
Weather Condition:	Sunny	**Antenna Height:**	2.0m	to bottom of antenna mount	

N



211-2-01APR2012

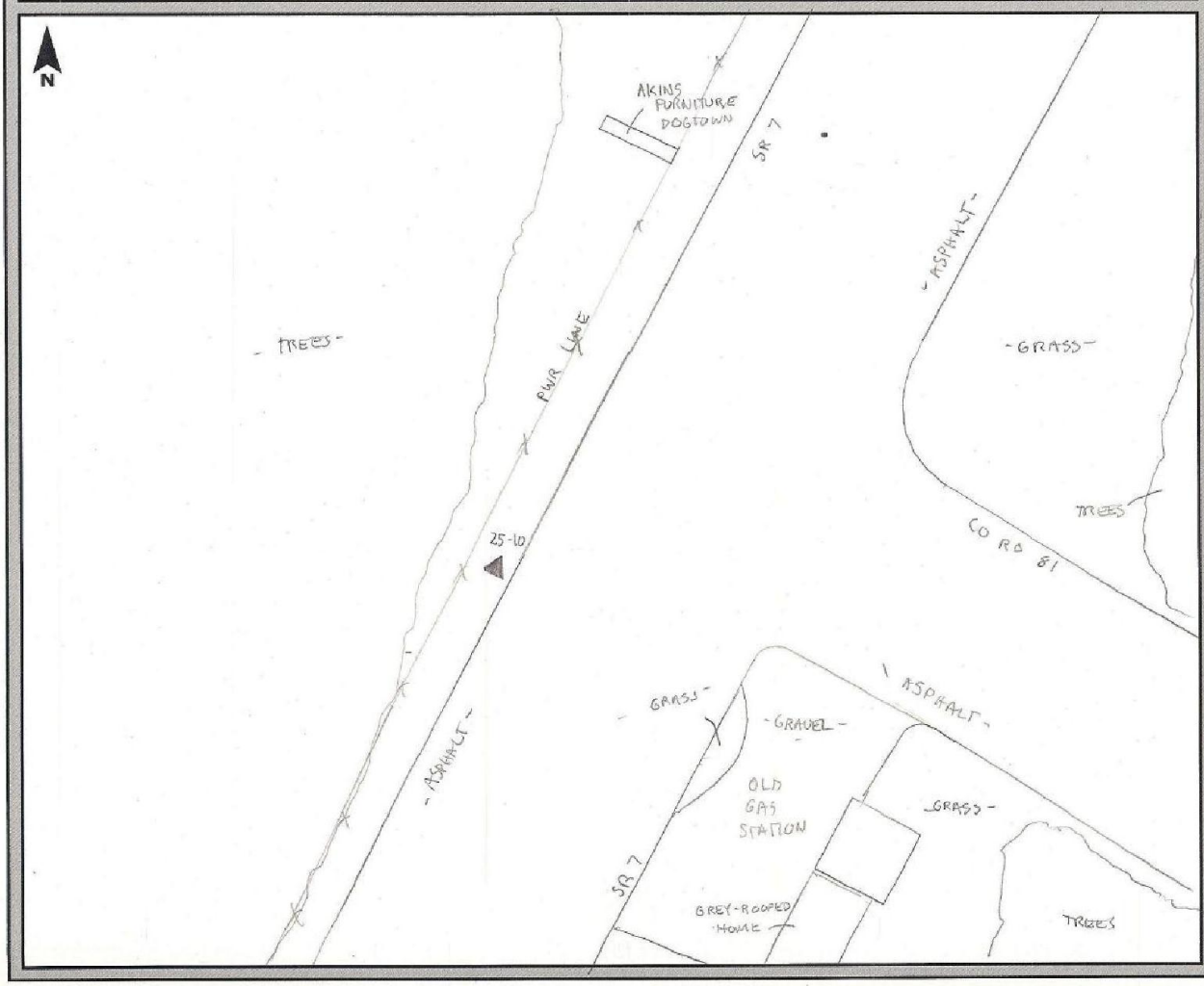
211-3S-01APR2012

211-3E-01APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:** 71899	**Survey Date:** 4/2/2012
Station Name:	25-10	**Operator Name:**	Cody Schneider
Latitude:	N 34° 22' 33.70"	**Julian Day:** 93	**Session No.** N/A
Longitude:	W85° 46' 44.23"	**Start Time:** 10:26	**End Time:** 18:45
Ellip. Height:	242.9 m	**Data File Name:**	77790930
Type of Mark:	Monument pair	**Type of Reciever:**	5800 #7779
Stamping on Mark:	25-10 1990	**Type of Antenna:**	5800 #7779
Weather Condition:	Partly Cloudy ≈ 75°	**Antenna Height:**	2.00 m to bottom of antenna mount



25 10-EE2309-1-02APR2012

25 10-EE2309-2-02APR2012

25 10-EE2309-3SE-02APR2012

25 10-EE2309-3NW-02APR2012

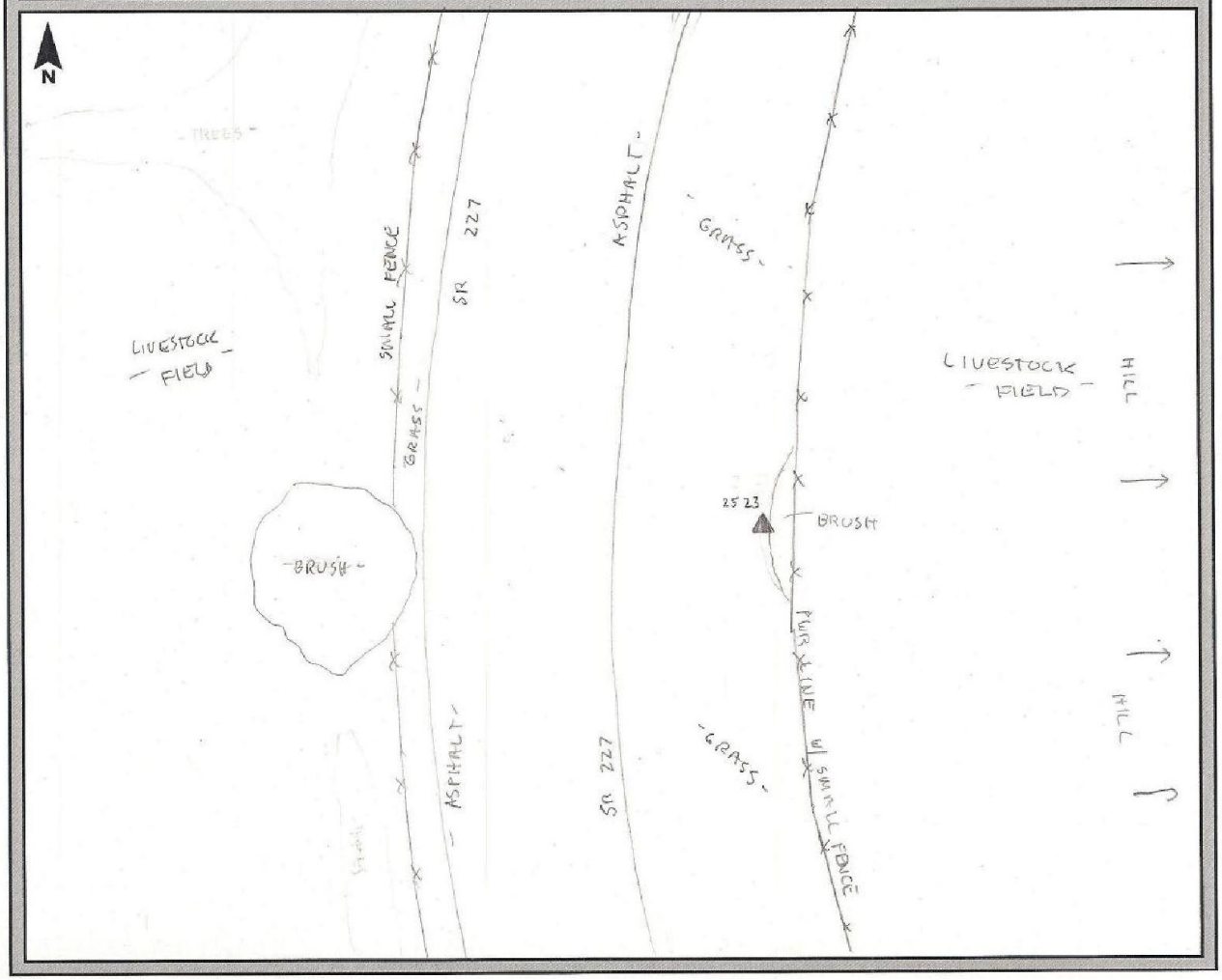
25 10-EE2309-3NE-02APR2012

25 10-EE2309-3SW-02APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:**	71899
Survey Date:	4/1/2012	**Station Name:**	25 23
Operator Name:	Cody Schneider	**Latitude:**	N34°19' 53.82"
Julian Day:	92	**Session No.**	N/A
Longitude:	W85°59'55.83"	**Start Time:**	1500
End Time:	18:04	**Ellip. Height:**	311.4 m
Data File Name:	21130922	**Type of Mark:**	Monument pair
Type of Reciever:	RS-2 #2113	**Stamping on Mark:**	25~23 1993
Type of Antenna:	RS-2 #2113	**Weather Condition:**	Partly Cloudy ≈80°
Antenna Height:	2.25 m to bottom of antenna mount		



25 23-AA2951-1-01APR2012

25 23-AA2951-2-01APR2012

25 23-AA2951-3E-01APR2012

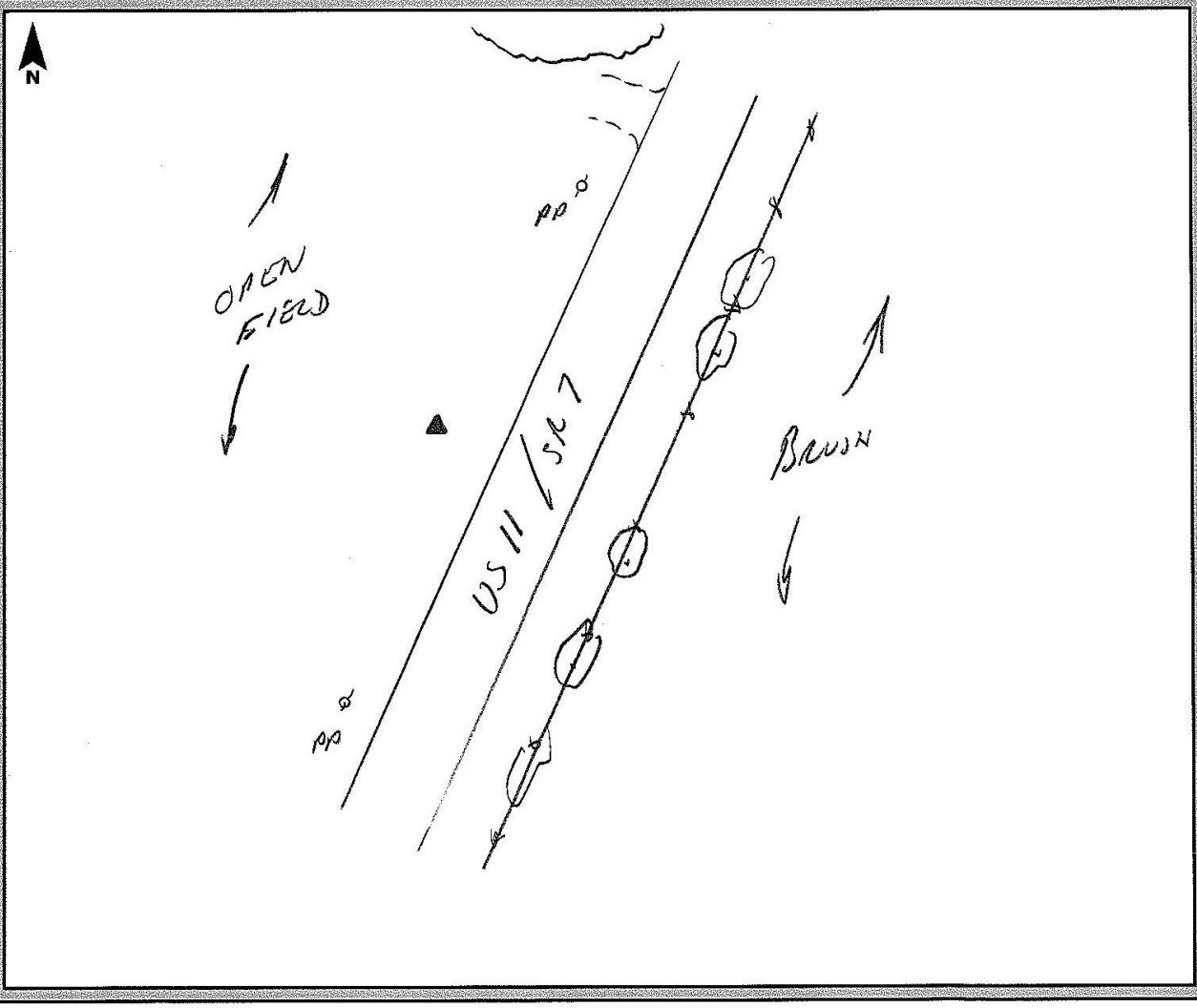
25 23-AA2951-3S-01APR2012

25 23-AA2951-3N-01APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	LiDAR QC - ALA. 3 County	Project Number:	71899
Survey Date:	4-3-12		
Station Name:	25-46 (AA1974)	Operator Name:	J SPEZIMAN
Latitude:	34° 36' 59.40"	Julian Day:	094
Session No.	2		
Longitude:	85° 36' 41.53"	Start Time:	2:56
End Time:	7:17		
Ellip. Height:	261.095 m	Data File Name:	6C100942.DAT
Type of Mark:	Brass Disk in Conc.	Type of Reciever:	TRIMBLE 4700
Stamping on Mark:	25-46 1993	Type of Antenna:	MICROCENTERED w/ GP
Weather Condition:	PC 80°	Antenna Height:	2.0 m to bottom of antenna mount



25_46-AA2974-BM-1-03APR2012

25_46-AA2974-BM-2-03APR2012

25_46-AA2974-BM-3NE-03APR2012

25_46-AA2974-BM-3SW-03APR2012

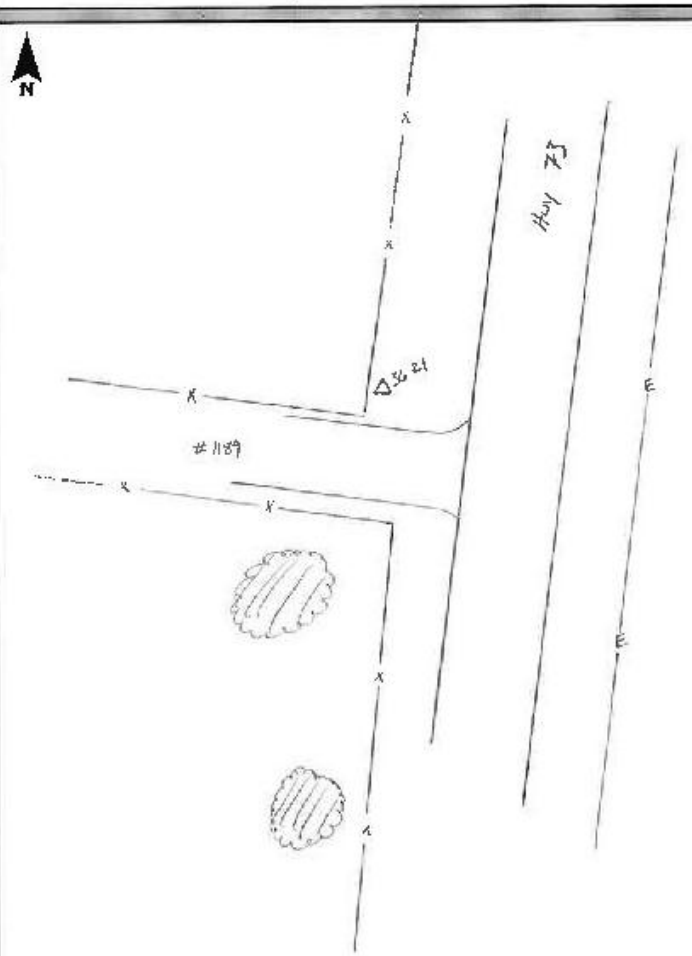
25_46-AA2974-BM-3NW-03APR2012

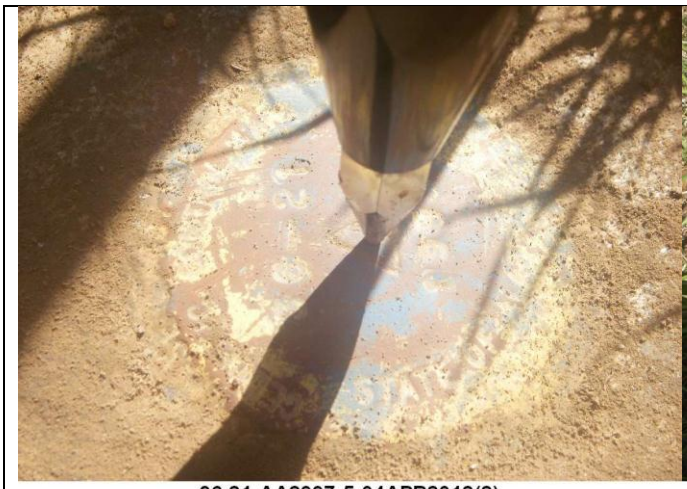
25_46-AA2974-BM-3SE-03APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	Jackson, Marshall and DeKalb Co, AL	**Project Number:**	7:897
Survey Date:	4/4/12		
Station Name:	JC 21	**Operator Name:**	Josh Nave
Latitude:	N 34 52 27.6	**Julian Day:**	095
Session No.	Static		
Longitude:	W 85 36 24.9	**Start Time:**	10:58
End Time:	3:22		
Ellip. Height:	1396.1'	**Data File Name:**	2/13075O.T02
Type of Mark:	Disk in Conc	**Type of Reciever:**	R8-3
Stamping on Mark:	JC-21/1993	**Type of Antenna:**	R8-3
Weather Condition:	Sunny	**Antenna Height:**	2.25m to bottom of antenna mount





36 21-AA2997-5-04APR2012(2)

36 21-AA2997-2-04APR2012

36 21-AA2997-3W-04APR2012

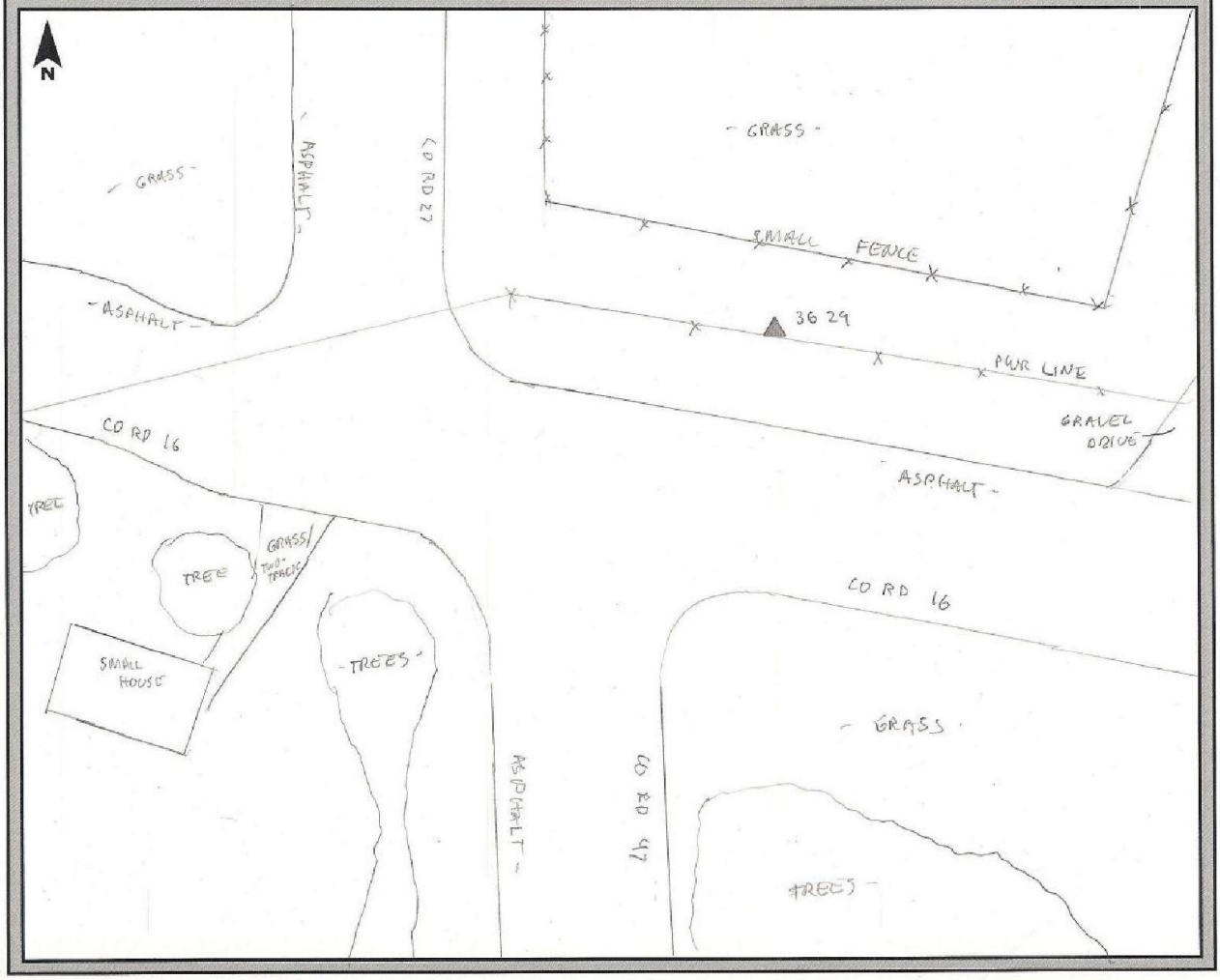
36 21-AA2997-3S-04APR2012

36 21-AA2997-3N-04APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:** 71899	**Survey Date:** 4/2/2012
Station Name:	36 29	**Operator Name:**	Cody Schneider
Latitude:	N 34° 36' 09.15"	**Julian Day:** 93	**Session No.** N/A
Longitude:	W 85° 51' 21.13"	**Start Time:** 11:38	**End Time:** 12:38
Ellip. Height:	410.4 m	**Data File Name:**	3629093A
Type of Mark:	Monument pair	**Type of Reciever:**	R8-3 #0364
Stamping on Mark:	36-29 1993	**Type of Antenna:**	R8-3 #0364
Weather Condition:	Partly Cloudy ≈78°	**Antenna Height:** 2.00 m	to bottom of antenna mount



36 29-AA3005-1-02APR2012

36 29-AA3005-2-02APR2012

36 29-AA3005-3E-02APR2012

36 29-AA3005-3W-02APR2012

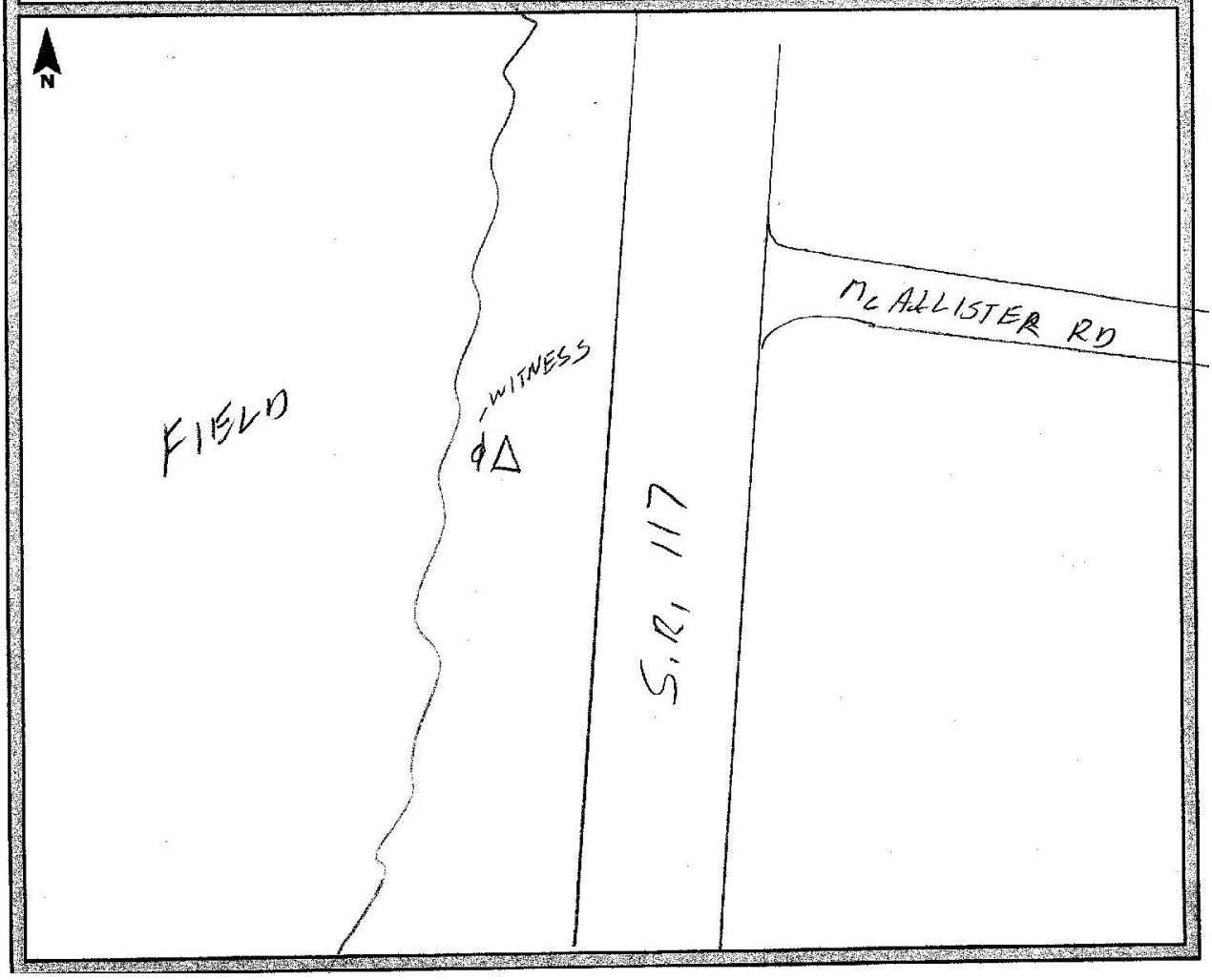
36 29-AA3005-3N-02APR2012

36 29-AA3005-3S-02APR2012

GPS Observation Log Sheet

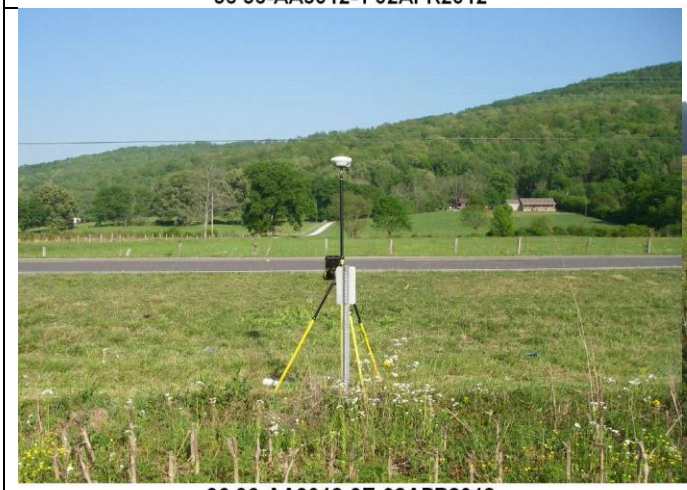
WOOLPERT

Project Name:	Jackson, Marshall and DeKalb Counties, AL	**Project Number:** 71899	**Survey Date:** 4/2/12
Station Name:	36 36	**Operator Name:**	Josh Nave
Latitude:	N 34-53-03.038	**Julian Day:** 093	**Session No.** STATIC
Longitude:	W 85-51-33.731	**Start Time:** 4:34PM	**End Time:** 5:31PM
Ellip. Height:	511.15 FT	**Data File Name:**	36360934
Type of Mark:	DISK IN CONC.	**Type of Reciever:**	Trimble R8 2
Stamping on Mark:	36 36 1990	**Type of Antenna:**	Trimble R8 2
Weather Condition:		**Antenna Height:**	6.89FT to bottom of antenna mount

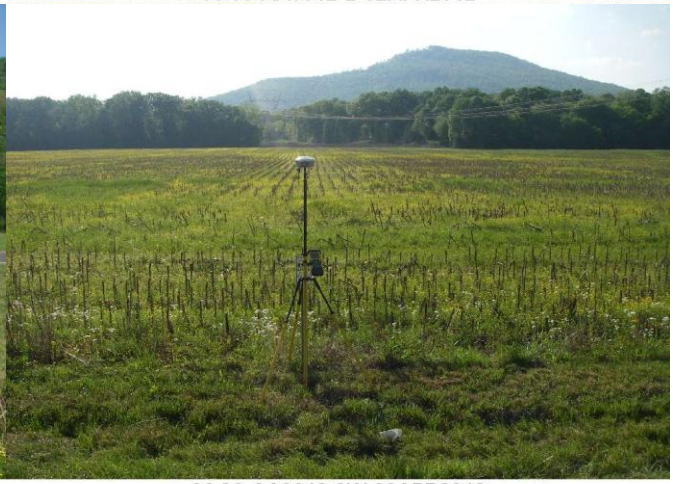


36 36-AA3012-1 02APR2012

36 36-AA3012-2-02APR2012

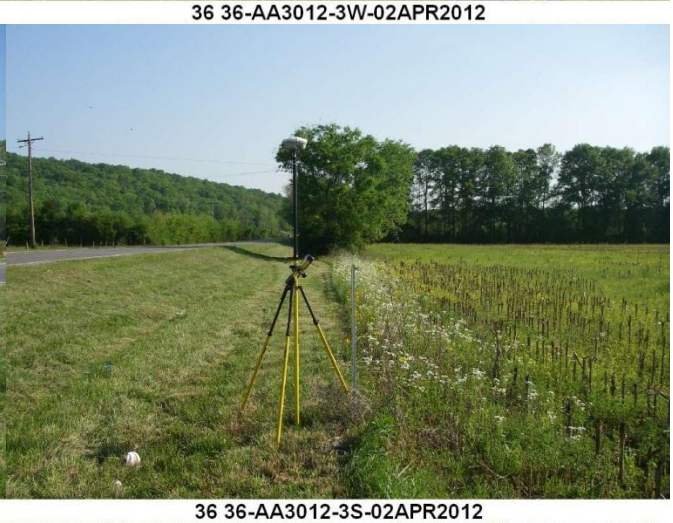


36 36-AA3012-3E-02APR2012



36 36-AA3012-3W-02APR2012

36 36-AA3012-3N-02APR2012

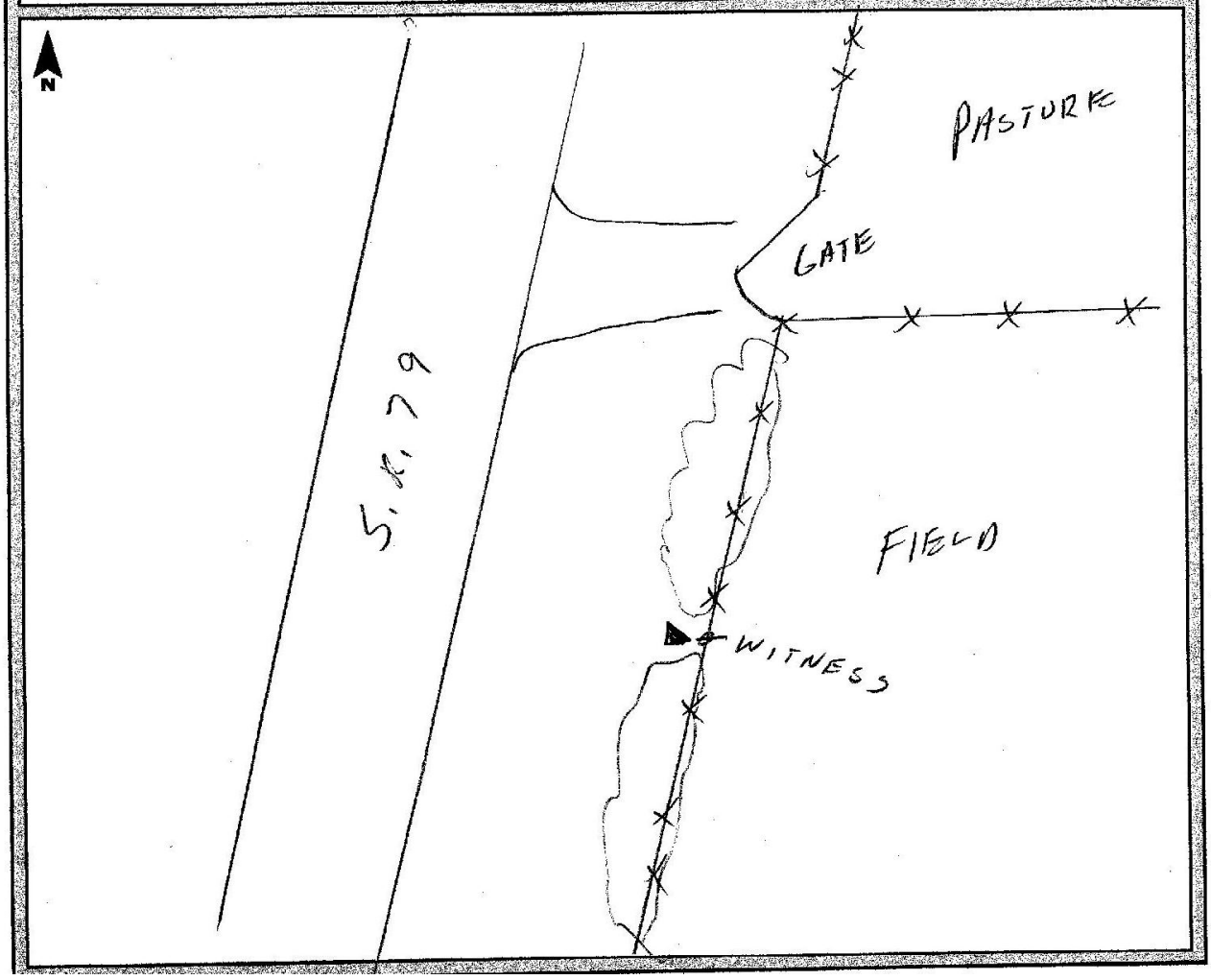


36 36-AA3012-3S-02APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	Jackson, Marshall and DeKalb Counties, AL	**Project Number:**	71899
Survey Date:	3/31/12		
Station Name:	36 47	**Operator Name:**	Josh Nave
Latitude:	N34-51-33.260	**Julian Day:**	091
Session No.	BASE		
Longitude:	W86-06-05.083	**Start Time:**	10:19AM
End Time:	3:52 PM		
Ellip. Height:	1607.10 FT	**Data File Name:**	0614091#
Type of Mark:	DISK IN CONC.	**Type of Reciever:**	Trimble R83
Stamping on Mark:	36-47 1990	**Type of Antenna:**	Trimble R83
Weather Condition:		**Antenna Height:**	6.562 to bottom of antenna mount



36 47-AA3022-1-31MAR2012

36 47-AA3022-2-31MAR2012

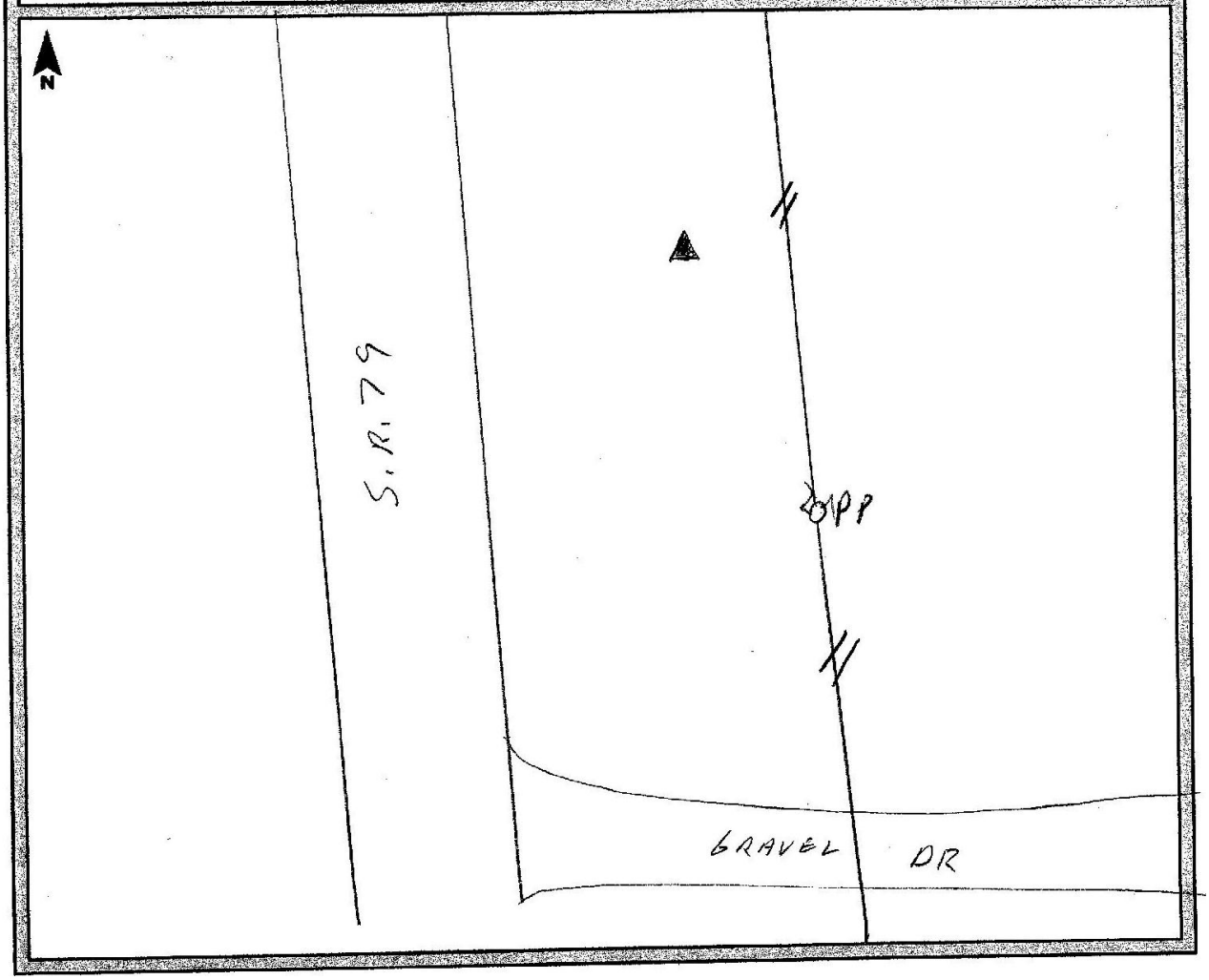
36 47-AA3022-3E-31MAR2012

36 47-AA3022-3N-31MAR2012

GPS Observation Log Sheet

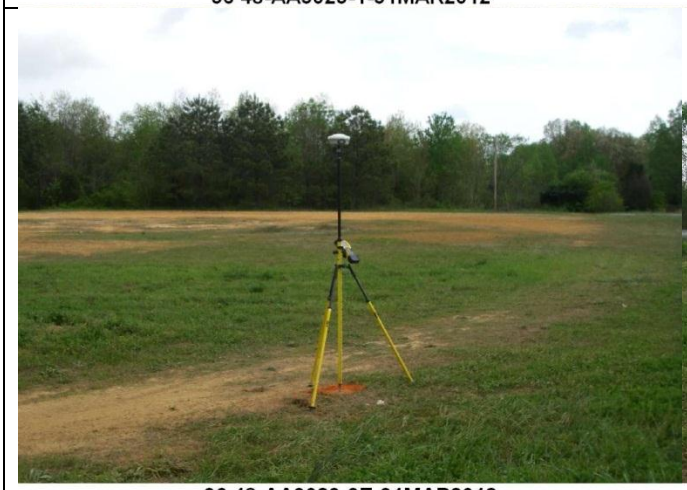
WOOLPERT

Project Name:	Jackson, Marshall and DeKalb Counties, AL	**Project Number:**	71899
Survey Date:	3/31/12		
Station Name:	36 48	**Operator Name:**	Josh Nave
Latitude:	N34-46-41.346	**Julian Day:**	091
Session No.	Static		
Longitude:	W 86-07-03.12	**Start Time:**	1:50PM
End Time:	2:24 PM		
Ellip. Height:	1473.54 FT	**Data File Name:**	59346911
Type of Mark:	DISK IN CONC.	**Type of Reciever:**	Trimble R8Z
Stamping on Mark:	36-48 1990	**Type of Antenna:**	Trimble R8Z
Weather Condition:		**Antenna Height:**	6.89FT to bottom of antenna mount



36 48-AA3023-1-31MAR2012

36 48-AA3023-2-31MAR2012



36 48-AA3023-3E-31MAR2012

36 48-AA3023-3W-31MAR2012

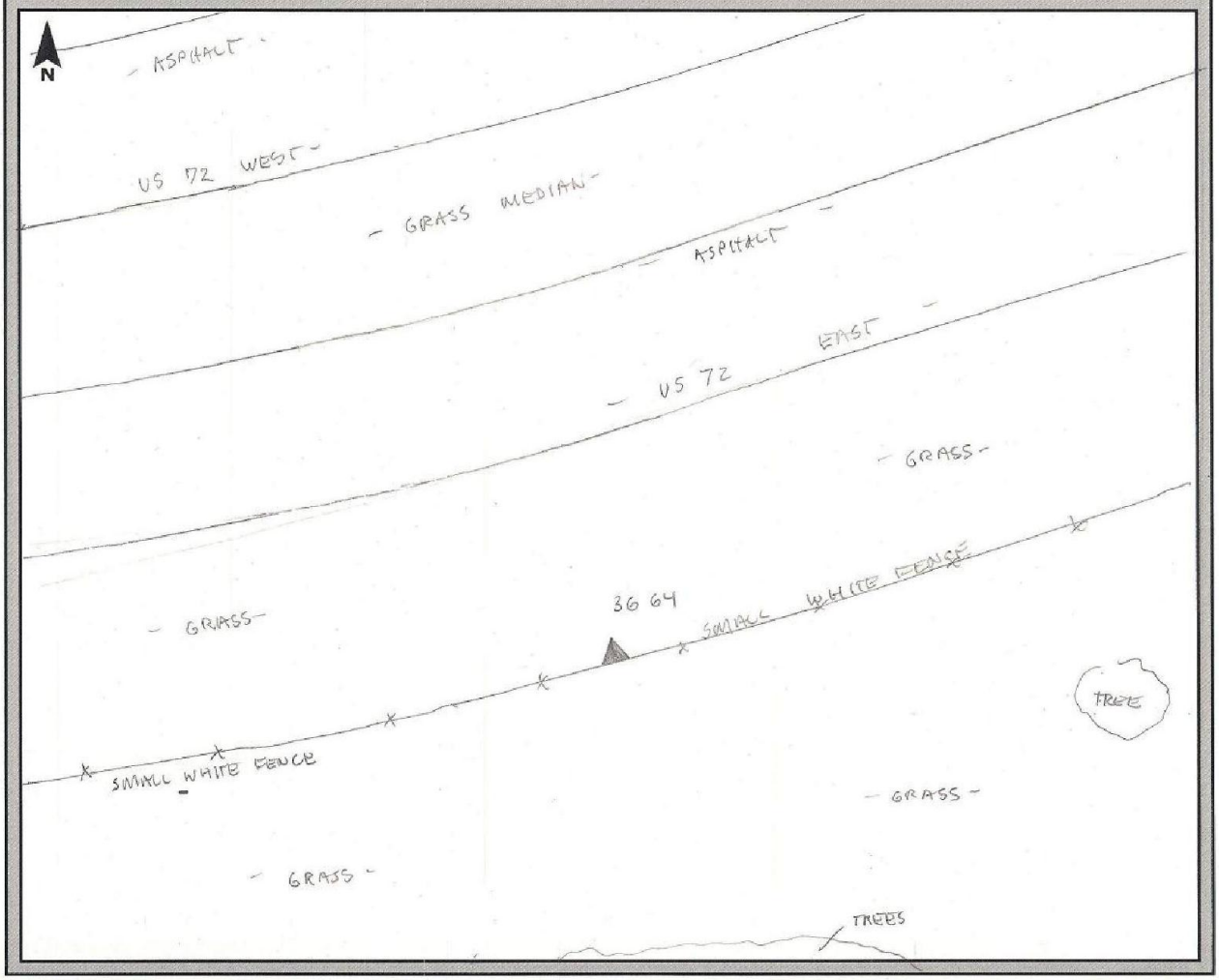
36 48-AA3023-3N-31MAR2012

36 48-AA3023-3S-31MAR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:** 71899	**Survey Date:** 3/30/2012
Station Name:	36 64	**Operator Name:**	Cody Schneider
Latitude:	N 34°36'24.72"	**Julian Day:** 90	**Session No.** N/A
Longitude:	W86°15'10.48"	**Start Time:** 11:29	**End Time:** 12:26
Ellip. Height:	157.3 m	**Data File Name:**	3664090A
Type of Mark:	FBN	**Type of Reciever:**	R6-3 #0364
Stamping on Mark:	36-64 1993	**Type of Antenna:**	R6-3 #0364
Weather Condition:	Cloudy ≈ 72°	**Antenna Height:** 2.00 m	to bottom of antenna mount

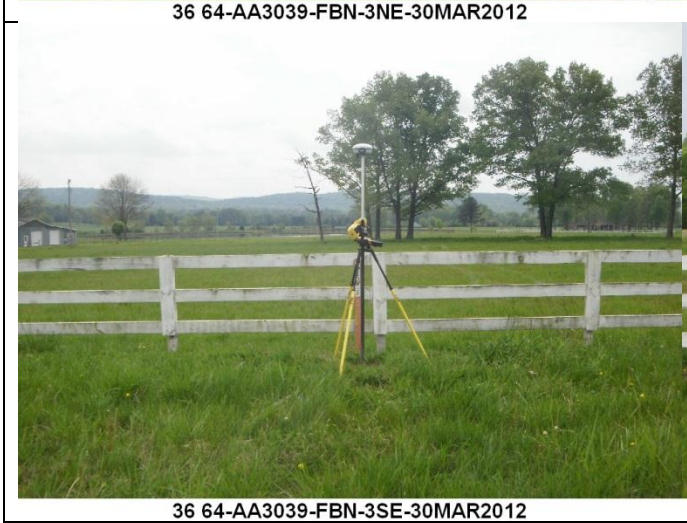


36 64-AA3039-FBN-1-30MAR2012

36 64-AA3039-FBN-2-30MAR2012

36 64-AA3039-FBN-3NE-30MAR2012

36 64-AA3039-FBN-3SW-30MAR2012



36 64-AA3039-FBN-3SE-30MAR2012

36 64-AA3039-FBN-3NW-30MAR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:** 071899	**Survey Date:** 3/28/2012
Station Name:	48 13	**Operator Name:**	Cody Schneider
Latitude:	N34° 13' 55.83"	**Julian Day:** 88	**Session No.** N/A
Longitude:	W86° 12' 16.21"	**Start Time:** 13:02	**End Time:** 17:33
Ellip. Height:	296.541 m	**Data File Name:**	21130880
Type of Mark:	FBN	**Type of Reciever:**	R8-2 #2113
Stamping on Mark:	48-13 1993	**Type of Antenna:**	R8-2 #2113
Weather Condition:	Partly Cloudy ≈ 72°	**Antenna Height:** 2.25 m	to bottom of antenna mount

48 13-AA3052-FBN-1-28MAR2012

48 13-AA3052-FBN-2-28MAR2012

48 13-AA3052-FBN-3E-28MAR2012

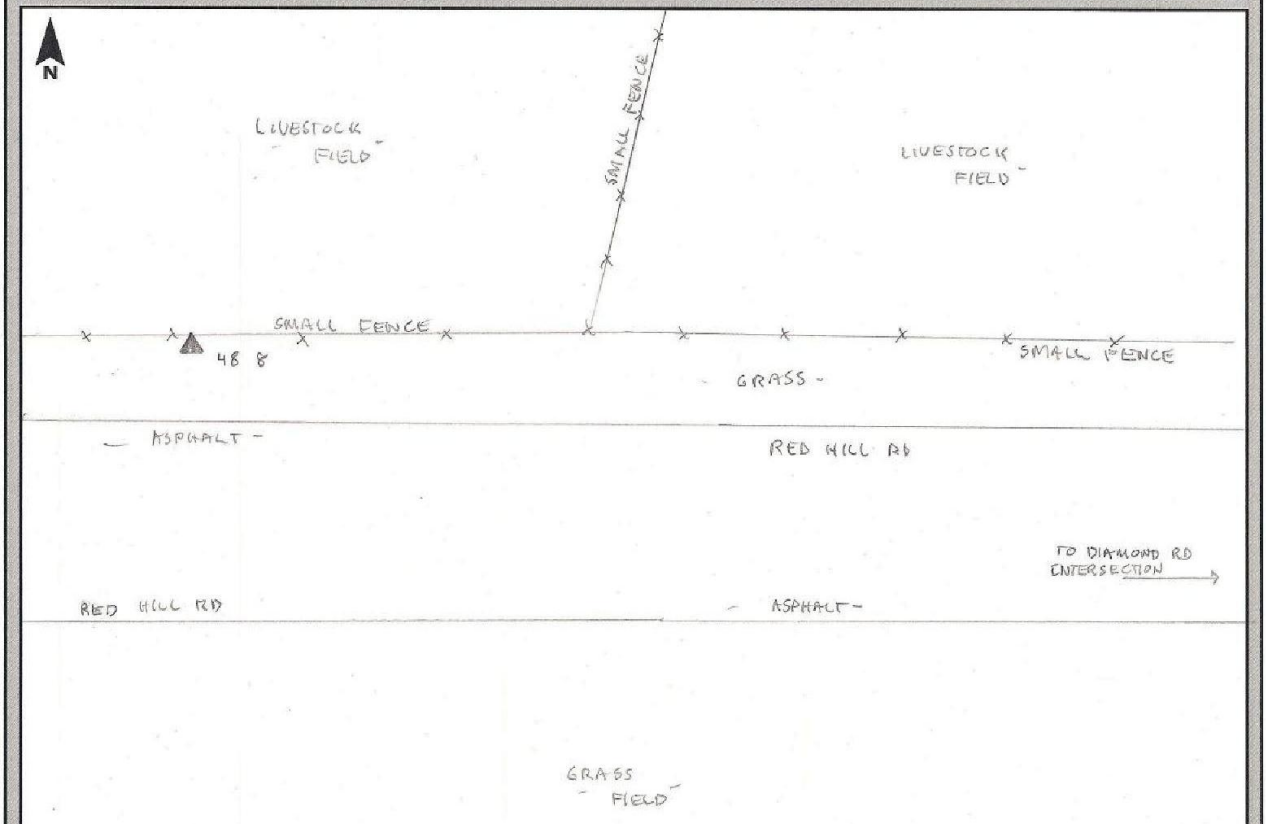
48 13-AA3052-FBN-3S-28MAR2012

48 13-AA3052-FBN-3N-28MAR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:** 71899	**Survey Date:** 3/28/2012
Station Name:	48 8	**Operator Name:**	Cody Schneider
Latitude:	N34° 15' 32.47"	**Julian Day:** 88	**Session No.**
Longitude:	W86° 25' 31.47"	**Start Time:** 14:23	**End Time:** 16:27
Ellip. Height:	174.1 m	**Data File Name:**	77790881
Type of Mark:	NGS mark	**Type of Reciever:**	5800 #7779
Stamping on Mark:	48-8 1993	**Type of Antenna:**	5800 #7779
Weather Condition:	Partly Cloudy ≈ 72°	**Antenna Height:** 2.00 m	to bottom of antenna mount



48 8-AA3047-1-28MAR2012

48 8-AA3047-2-28MAR2012

48 8-AA3047-3N-28MAR2012

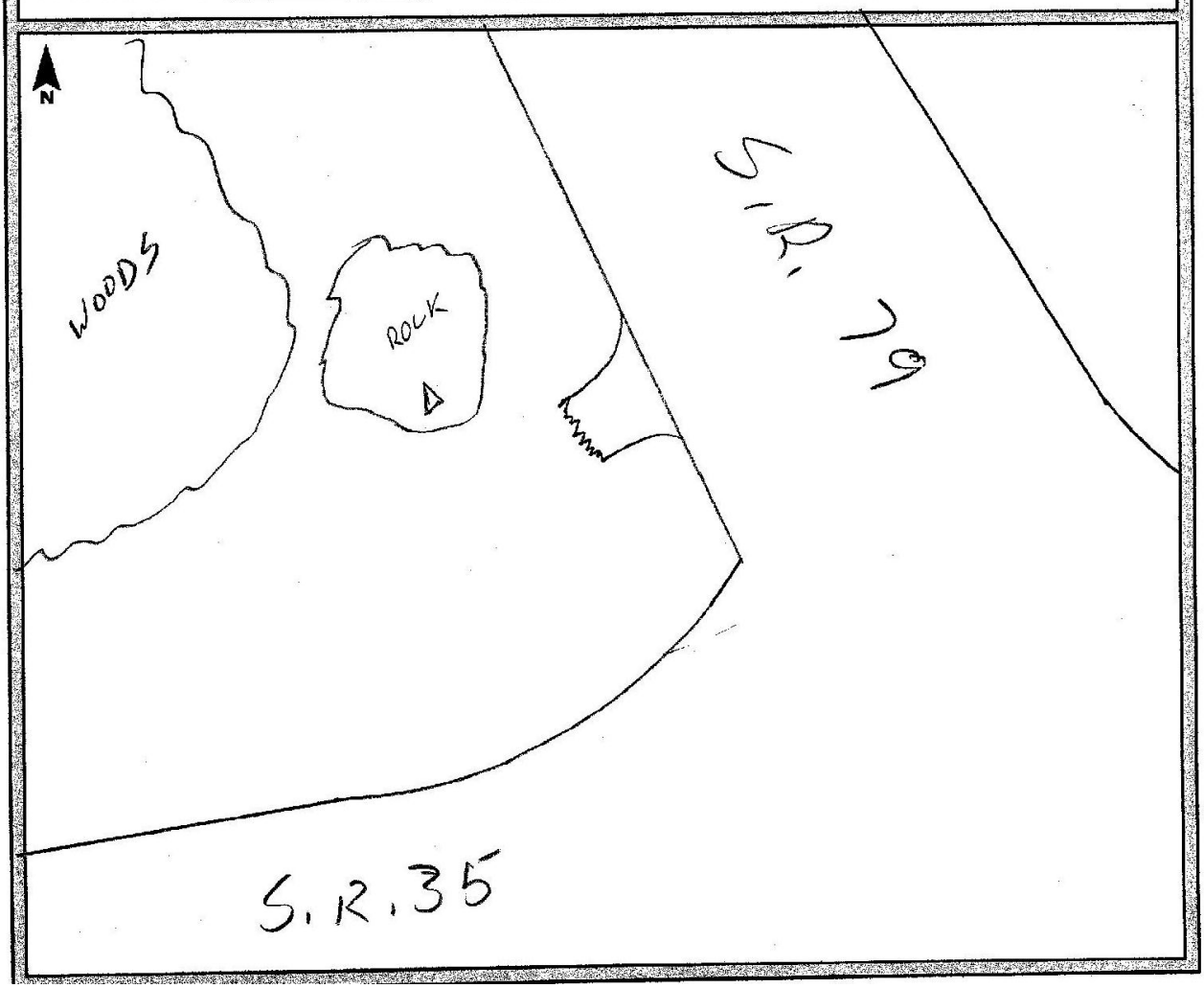
48 8-AA3047-3W-28MAR2012

48 8-AA3047-3E-28MAR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	Jackson, Marshall and DeKalb Counties, AL	**Project Number:**	71899
Station Name:	K 476	**Survey Date:**	3/31/12
Latitude:	N34-41-11.246	**Operator Name:**	Josh Nave
Longitude:	W86-06-00.755	**Julian Day:**	091
Ellip. Height:	559.77FT	**Session No.**	BASE
Type of Mark:	DISK IN BEDROCK	**Start Time:**	8:32AM
Stamping on Mark:	K 476 1988	**End Time:**	4:11PM
Weather Condition:		**Data File Name:**	K476091A
		Type of Reciever:	Trimble 4000SSI
		Type of Antenna:	Trimble M/C L1/L2
		Antenna Height:	6.562 FT to bottom of antenna mount



K 476-EF1323-1-31MAR2012

K 476-EF1323-2-31MAR2012

K 476-EF1323-3N-31MAR2012

K 476-EF1323-3E-31MAR2012

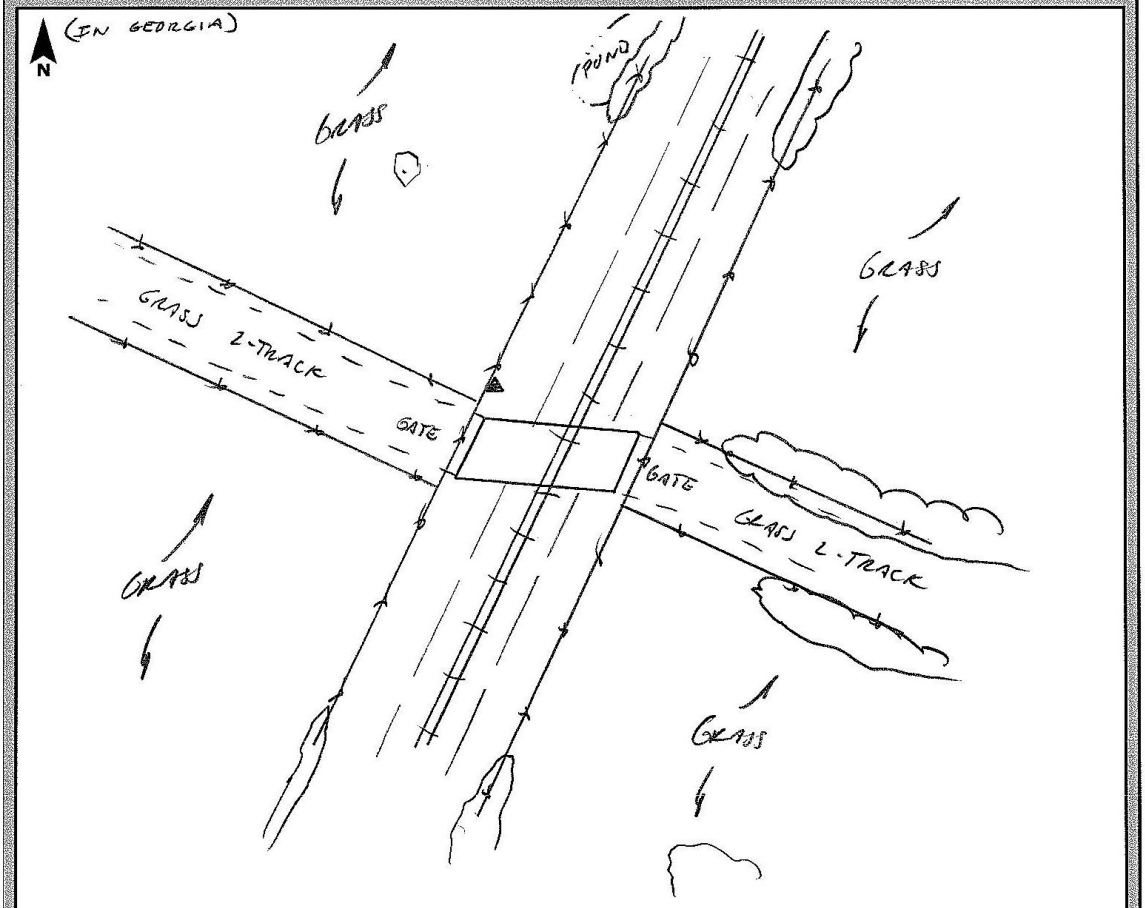
K 476-EF1323-3S-31MAR2012

K 476-EF1323-3W-31MAR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	LiDAR QC NCA - 3 County	**Project Number:**	71899
Survey Date:	4-3-12		
Station Name:	Q120 (EE0971)	**Operator Name:**	J SPEELMAN
Latitude:	34°41'56.57"	**Julian Day:**	094
Session No.	1		
Longitude:	85°32'04.09"	**Start Time:**	4:24
End Time:	4:59		
Ellip. Height:	732.059'	**Data File Name:**	88100
Type of Mark:	Brass Disk in Conc.	**Type of Reciever:**	TRIMBLE R8-2 (4708128810)
Stamping on Mark:	Q120 1994	**Type of Antenna:**	INTERNAL
Weather Condition:	PC 83°	**Antenna Height:**	2.0 m to bottom of antenna mount



Q_120-EE0971-BM-1-03APR2012

Q_120-EE0971-BM-2-03APR2012

Q_120-EE0971-BM-3NE-03APR2012

Q_120-EE0971-BM-3SW-03APR2012

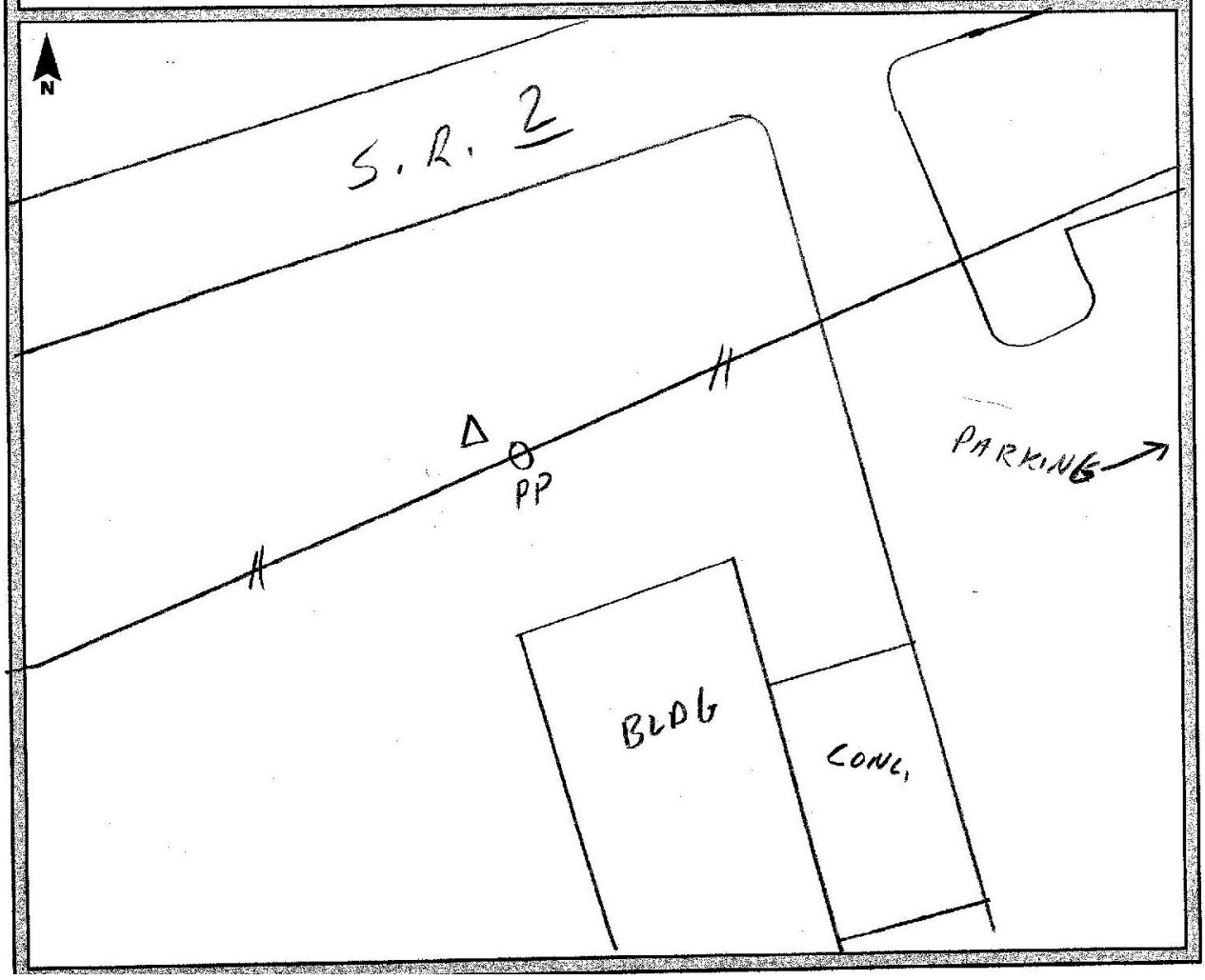
Q_120-EE0971-BM-3NW-03APR2012

Q_120-EE0971-BM-3SE-03APR2012

GPS Observation Log Sheet

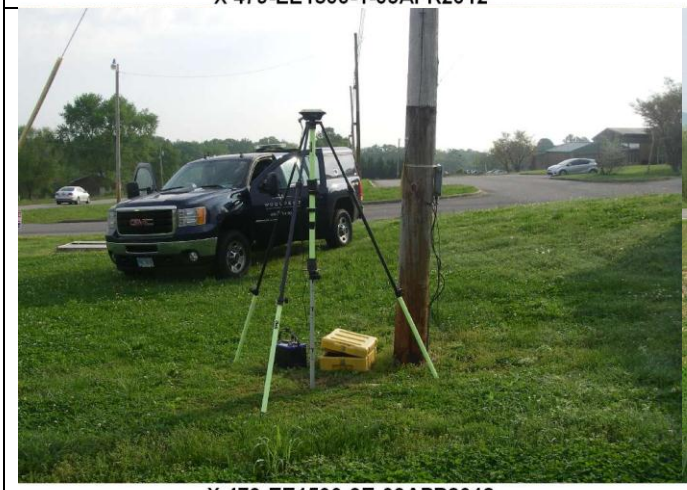
WOOLPERT

Project Name:	Jackson, Marshall and DeKalb Counties, AL	**Project Number:** 71899	**Survey Date:** 4/3/12
Station Name:	X 479	**Operator Name:**	Josh Nave
Latitude:	N34-54-49.687	**Julian Day:** 094	**Session No.** BASE
Longitude:	W85-46-24.329	**Start Time:** 8:39AM	**End Time:** 6:17PM
Ellip. Height:	528.61 FT	**Data File Name:**	X479094A
Type of Mark:	SS ROD	**Type of Reciever:** Trimble	4000SSI
Stamping on Mark:	X 479 1983	**Type of Antenna:** Trimble	M/L L1/L2
Weather Condition:		**Antenna Height:** 6.562 FT	to bottom of antenna mount



X 479-EE1500-1-03APR2012

X 479-EE1500-2-03APR2012



X 479-EE1500-3E-03APR2012

X 479-EE1500-3W-03APR2012

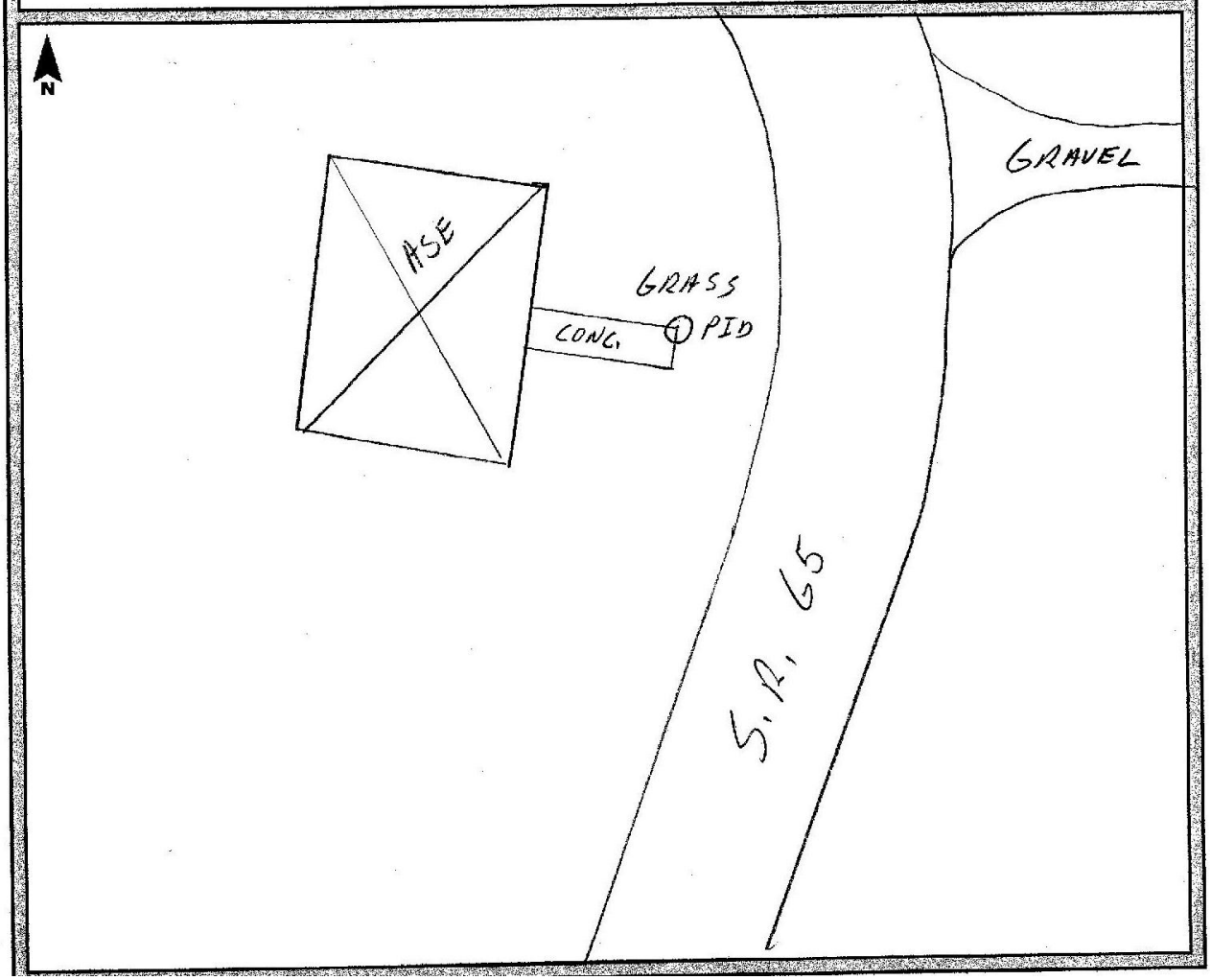
X 479-EE1500-3N-03APR2012

X 479-EE1500-3S-03APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	Jackson, Marshall and DeKalb Counties, AL	**Project Number:**	71899
Survey Date:	4/1/12		
Station Name:	1001	**Operator Name:**	Josh Nave
Latitude:	N 34-54-30.044	**Julian Day:**	092
Session No.	ROVER		
Longitude:	W 86-12-54.755	**Start Time:**	11:39AM
End Time:	11:05AM		
Ellip. Height:	577.504 FT	**Data File Name:**	59340920.dat
Type of Mark:	PID	**Type of Reciever:**	Trimble R82
Stamping on Mark:	N/A	**Type of Antenna:**	Trimble R82
Weather Condition:		**Antenna Height:**	6.89 FT to bottom of antenna mount



1001-2-31MAR2012

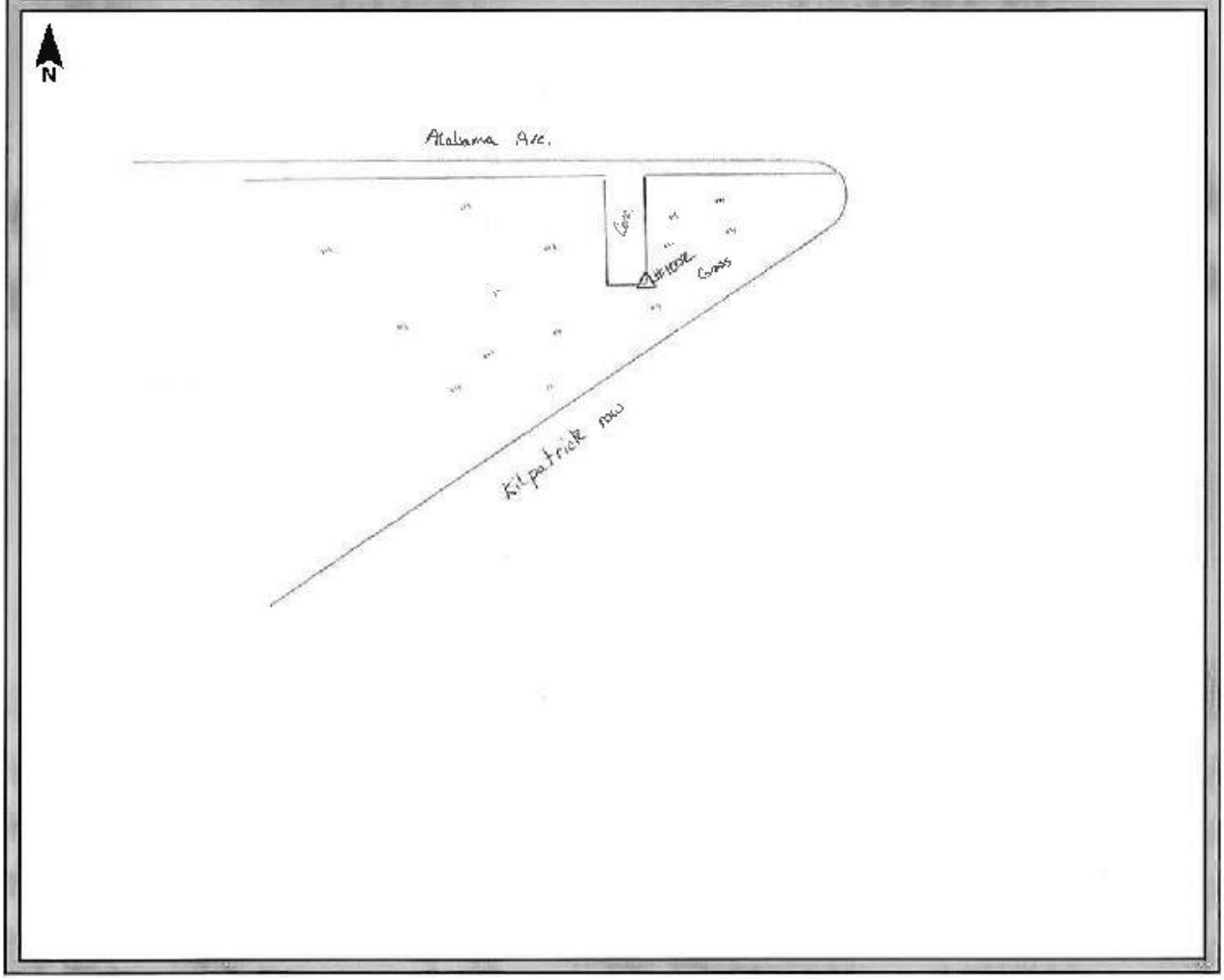
1001-3S-31MAR2012

1001-3W-31MAR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	Jackson, Marshall, and DeKalb Co, AL	**Project Number:**	71899	**Survey Date:**	4/4/12
Station Name:	1002	**Operator Name:**	Josh Nave		
Latitude:	N 34 Se 50.7	**Julian Day:**	095	**Session No.**	n/a
Longitude:	W85 42 49.2	**Start Time:**	RTK	**End Time:**	RTK
Ellip. Height:	516.7	**Data File Name:**			
Type of Mark:	PID - Conc. Corner / Chisel Cross	**Type of Reciever:**	R8-2		
Stamping on Mark:	N/A	**Type of Antenna:**	R8-2		
Weather Condition:	Sunny	**Antenna Height:**	2.0m	to bottom of antenna mount	



1002-2-04APR2012

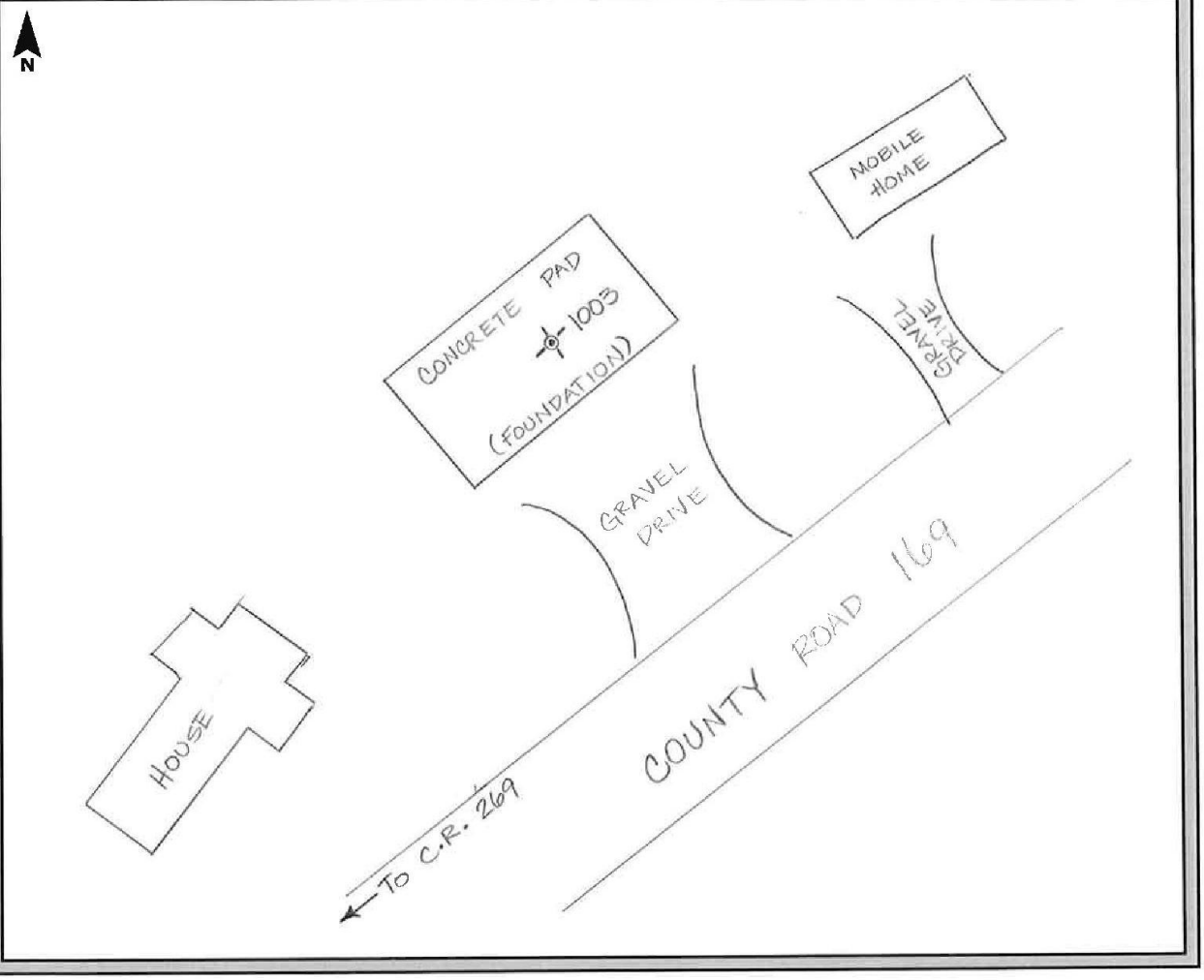
1002-3W-04APR2012

1002-3N-04APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	AL LiDAR - Jackson Marshall DeKalb	**Project Number:**	071899
Survey Date:	04 APR 2012		
Station Name:	1003	**Operator Name:**	KELLEE HARGIS
Latitude:	34°50'54.84394"	**Julian Day:**	95
Session No.			
Longitude:	85°35'50.79999"	**Start Time:**	1:02 PM
End Time:	1:05 PM		
Ellip. Height:	392.450 m	**Data File Name:**	AL_LIDAR_95_CJS
Type of Mark:	CONCRETE FOUNDATION	**Type of Reciever:**	TRIMBLE
Stamping on Mark:	N/A	**Type of Antenna:**	R8-3
Weather Condition:	FAIR / SUNNY 80°F	**Antenna Height:**	2.000 m to bottom of antenna mount



1003-3-04APR2012

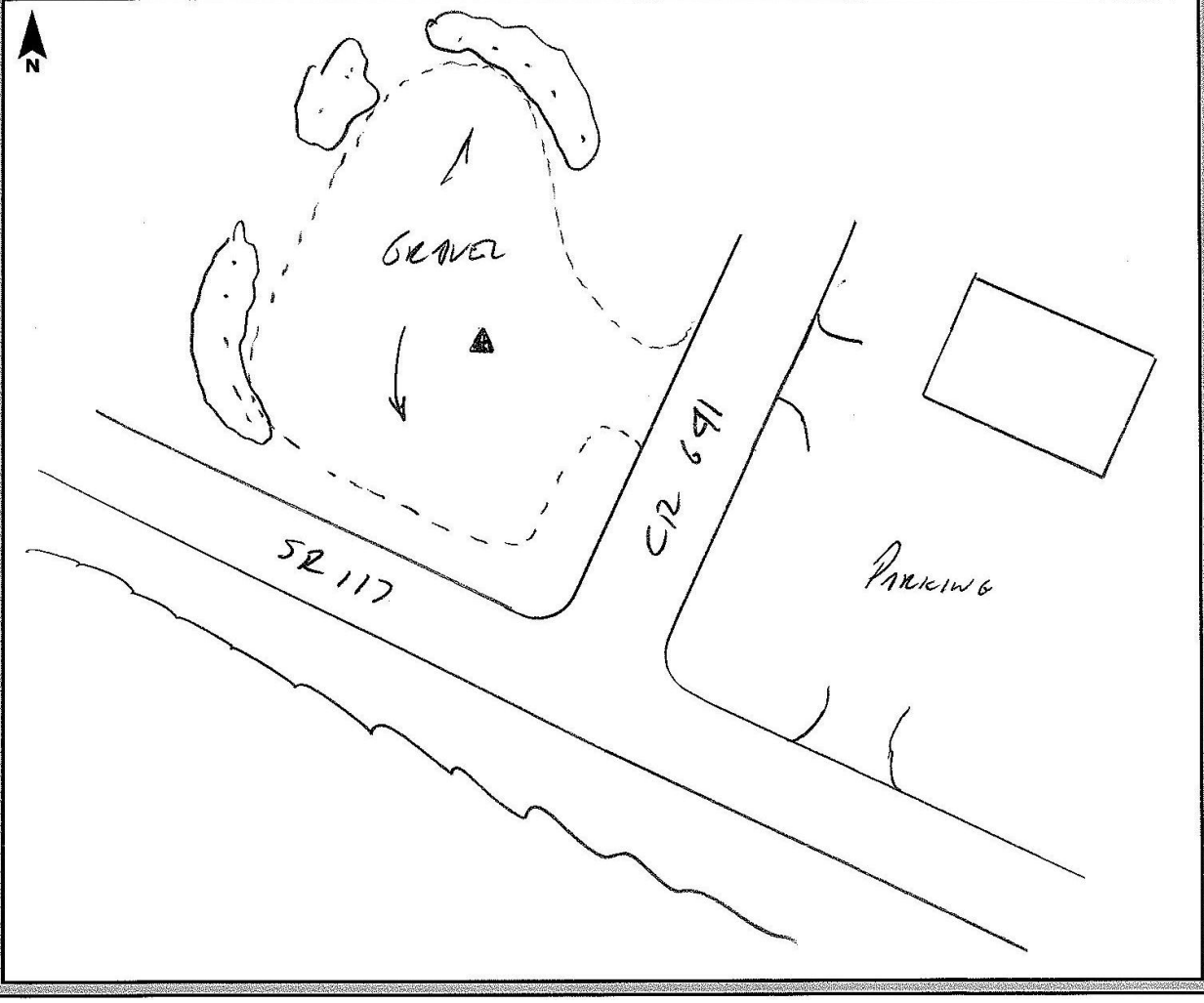
1003-3NW-04APR2012

1003-3NE-04APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	LiDAR QC - ALA 3 COUNTY	Project Number:	71899
Survey Date:	9-3-12		
Station Name:	1004	Operator Name:	J SNEDEMAN
Latitude:	34° 33' 33.10"	Julian Day:	894
Session No.			
Longitude:	85° 33 00.72"	Start Time:	6:17
End Time:	7:00		
Ellip. Height:	1552.485'	Data File Name:	88100943.T15
Type of Mark:	PAINT MARK	Type of Reciever:	TRIMBLE R8-2
Stamping on Mark:	—	Type of Antenna:	INTERNAL
Weather Condition:	PC 90°	Antenna Height:	2.0m to bottom of antenna mount



1004-2-03APR2012

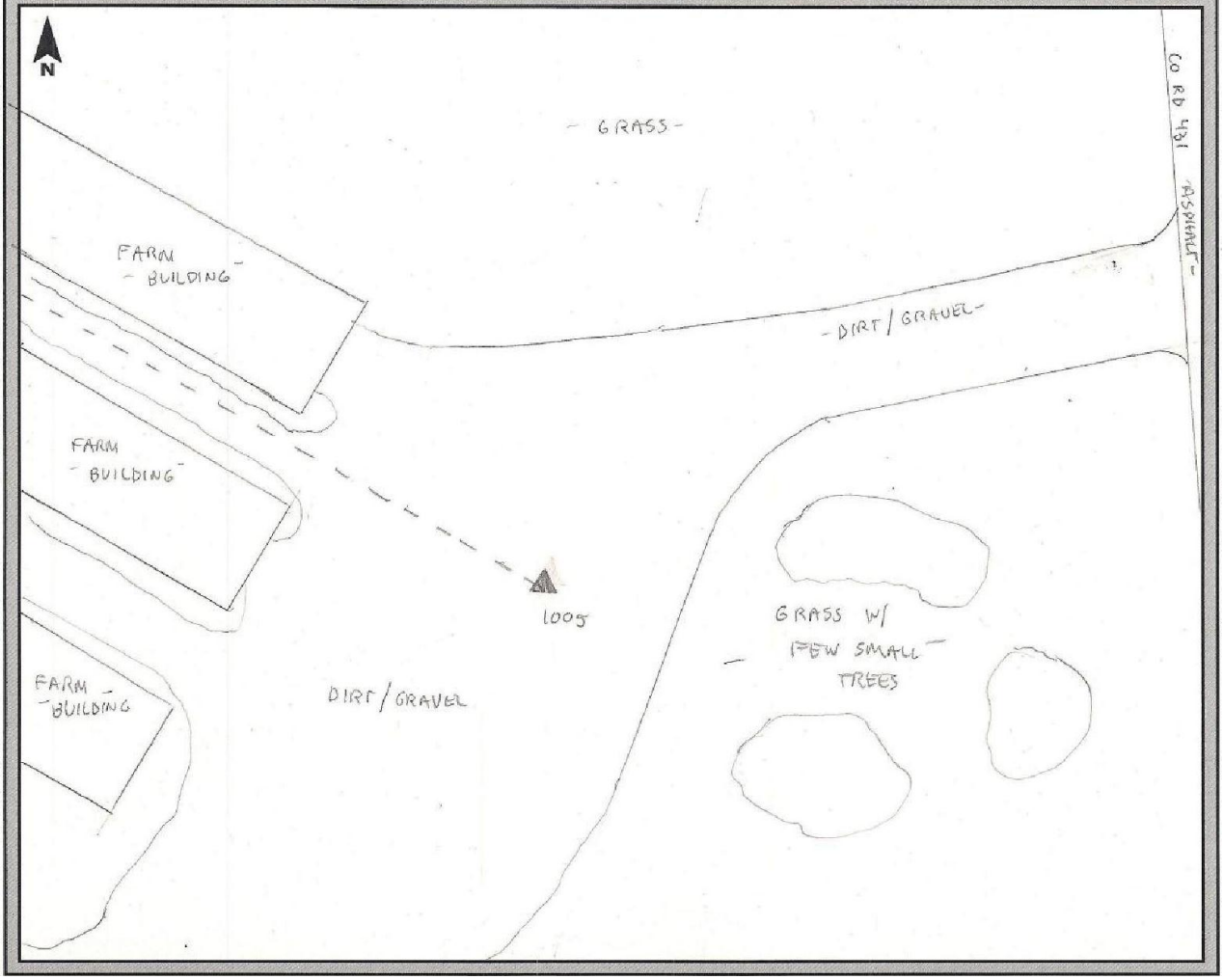
1004-3NE-03APR2012

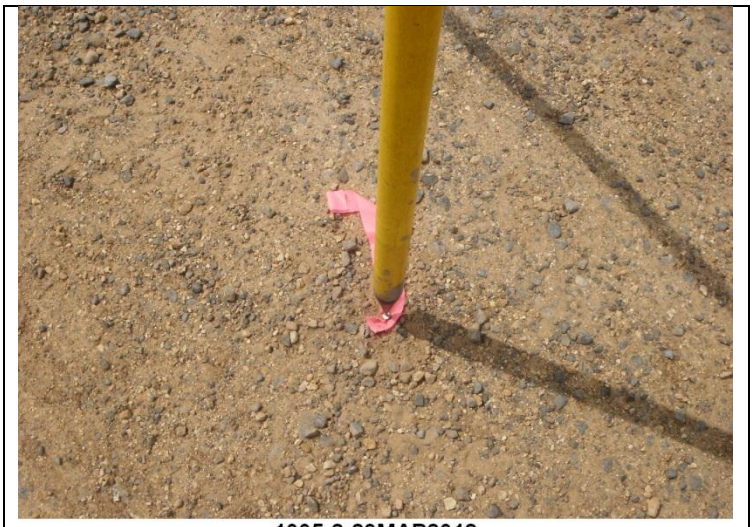
1004-3SE-03APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:** 71894	**Survey Date:** 3/29/2012
Station Name:	1005	**Operator Name:**	Cody Schneider
Latitude:	N34° 12' 20.10"	**Julian Day:** 89	**Session No.** N/A
Longitude:	W86° 06' 10.16"	**Start Time:** 12:11	**End Time:** 12:16
Ellip. Height:	295.781 m	**Data File Name:**	AL-LIDAR-89-CES
Type of Mark:	Nail w/ ribbon	**Type of Reciever:**	R8-3 #0364
Stamping on Mark:	N/A	**Type of Antenna:**	R8-3 #0364
Weather Condition:	Partly Cloudy 74°	**Antenna Height:**	2.00 m to bottom of antenna mount





1005-2-29MAR2012

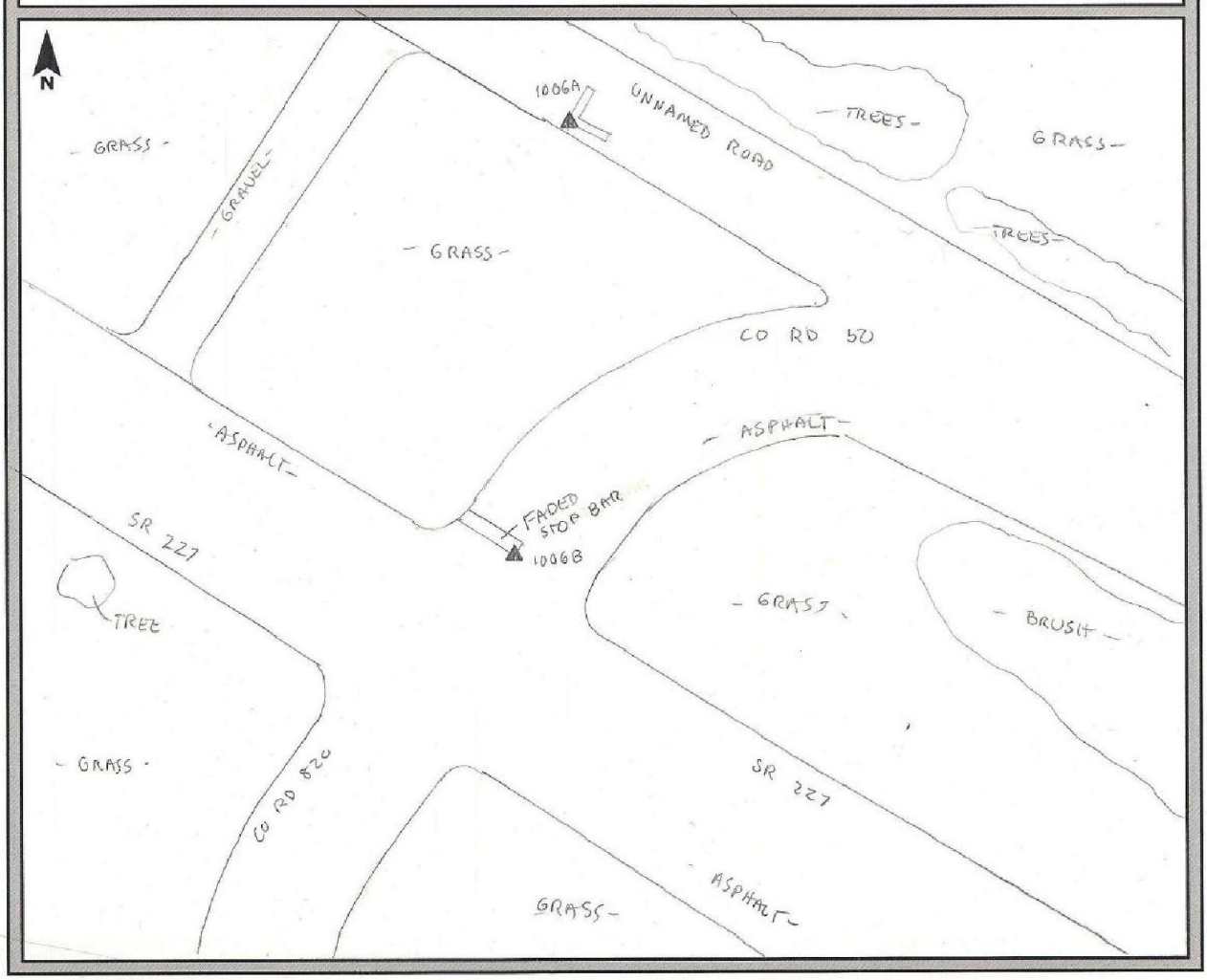
1005-3N-29MAR2012

1005-3W-29MAR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:**	71899 **Survey Date:** 4/2/2012
Station Name:	1006A / 1006B	**Operator Name:**	Cody Schneider
Latitude:	N34°26'40.56" / N34°26'39.13"	**Julian Day:**	93 **Session No.** N/A
Longitude:	W86°05'17.75" / W86°05'17.42"	**Start Time:**	13:22 / 13:35 **End Time:** 13:27 / 13:40
Ellip. Height:	322.3 m / 325.0	**Data File Name:**	AL_LIDAR_93_CJS
Type of Mark:	Mag nails	**Type of Reciever:**	R8-3 #0364
Stamping on Mark:	N/A	**Type of Antenna:**	R8-3 #0364
Weather Condition:	Partly Cloudy ≈ 79°	**Antenna Height:**	2.00 m to bottom of antenna mount



1006A-2-02APR2012

1006A-3SW-02APR2012

1006A-3NW-02APR2012

1006B-2-02APR2012

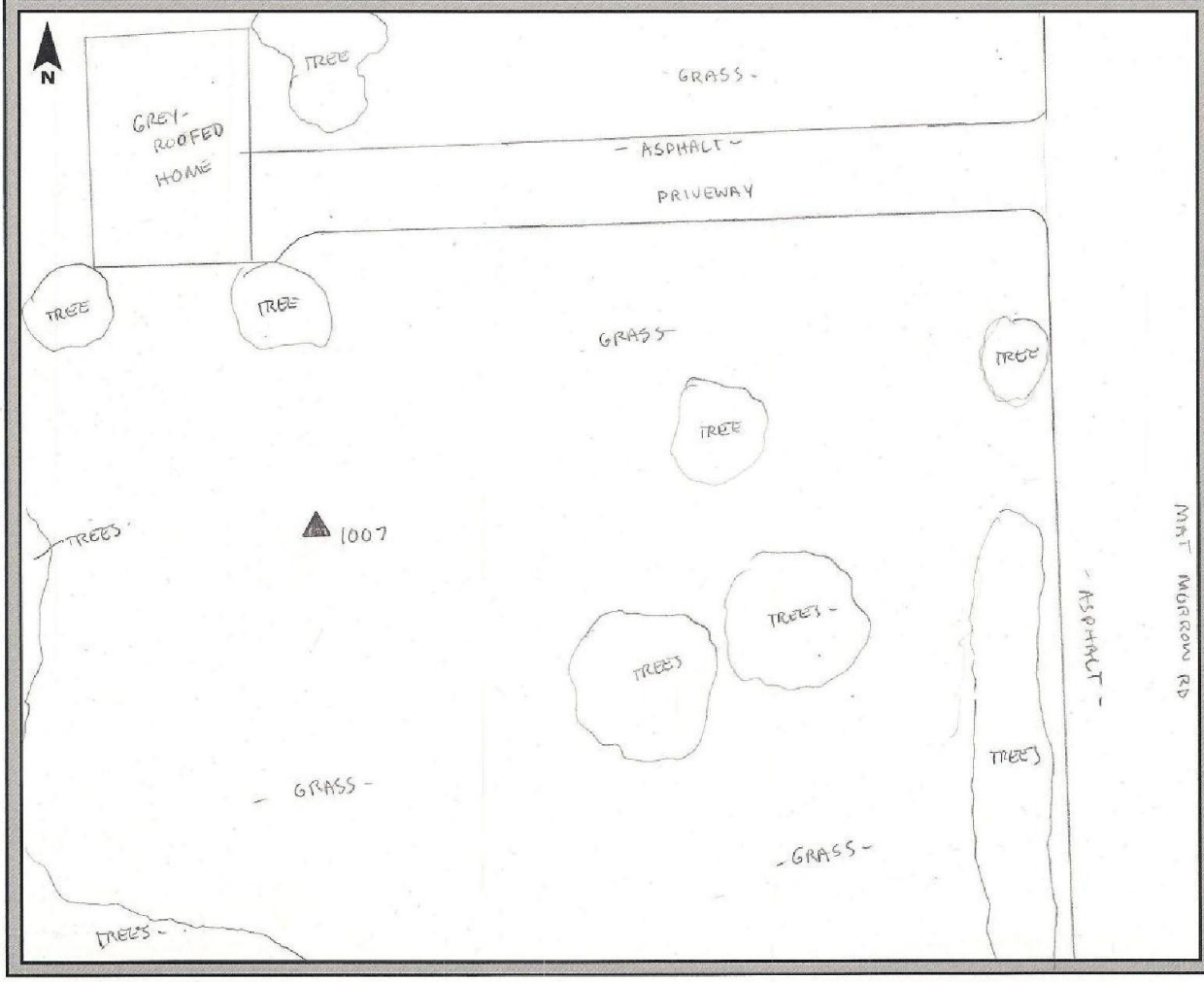
1006B-3SE-02APR2012

1006B-3SW-02APR2012

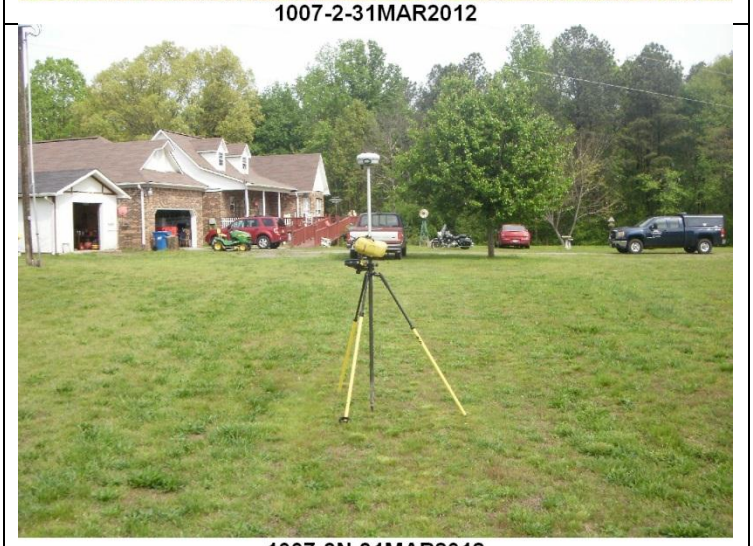
GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:**	71899	**Survey Date:**	3/31/2012
Station Name:	1007	**Operator Name:**	Cody Schneider		
Latitude:	N34° 18' 50.28"	**Julian Day:**	91	**Session No.**	N/A
Longitude:	W86° 54' 13.97"	**Start Time:**	10:38	**End Time:**	10:43
Ellip. Height:	301.51m	**Data File Name:**	AL-LIDAR_91_CJS		
Type of Mark:	N/A	**Type of Reciever:**	R8-3 #0364		
Stamping on Mark:	N/A	**Type of Antenna:**	R8-3 #0364		
Weather Condition:	Mostly cloudy ≈68°	**Antenna Height:**	2.00m	to bottom of antenna mount	



1007-2-31MAR2012



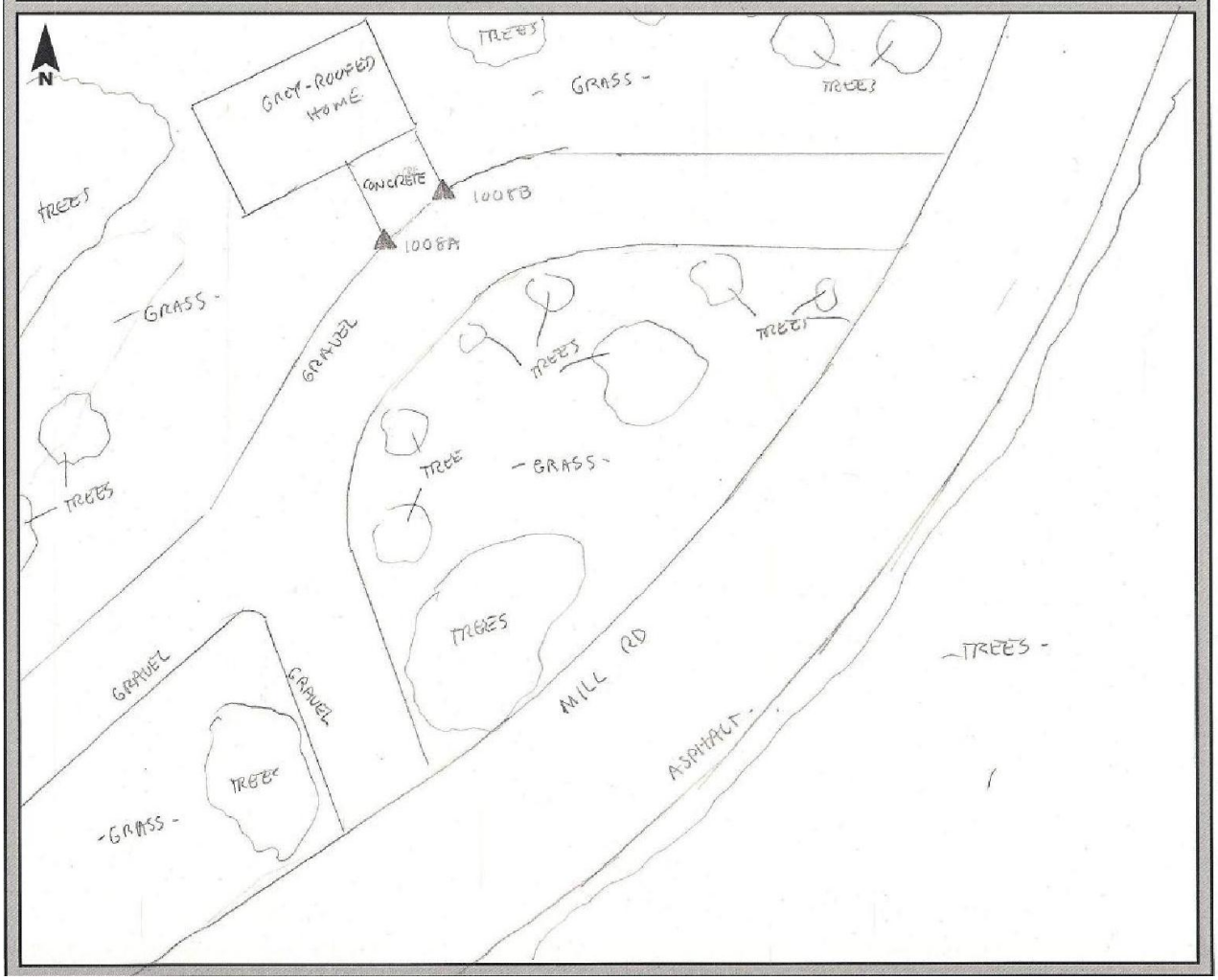
1007-3N-31MAR2012

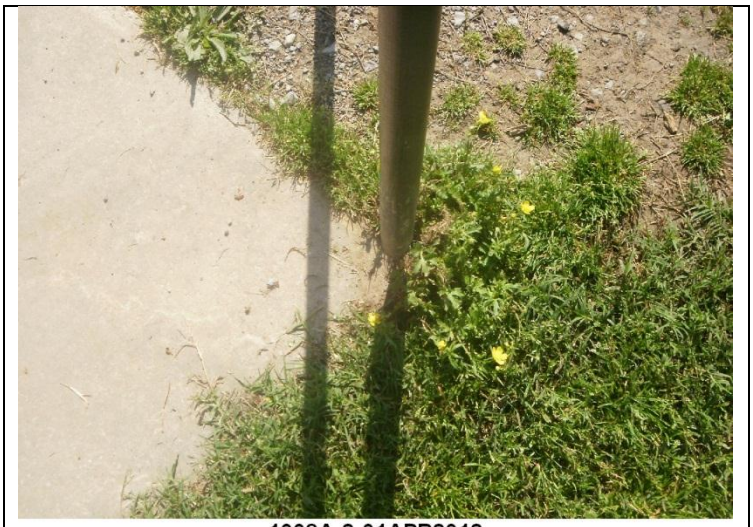
1007-3W-31MAR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:**	71899
Survey Date:	9/1/2012		
Station Name:	1008A / 1008B	**Operator Name:**	Cody Schneider
Latitude:	N34° 35' 37.32" / N34° 35' 37.43"	**Julian Day:**	92
Session No.	N/A		
Longitude:	W86° 16' 22.00" / W 86° 16' 21.67"	**Start Time:**	10:10 / 10:16
End Time:	10:15 / 10:22		
Ellip. Height:	159.5 m / 159.6 m	**Data File Name:**	AL_LIDAR_92_CSS
Type of Mark:	Marked points	**Type of Reciever:**	R8-3 #0364
Stamping on Mark:	N/A	**Type of Antenna:**	R8-3 #0364
Weather Condition:	Partly Cloudy @ 72°	**Antenna Height:**	2.00 m to bottom of antenna mount





1008A-2-01APR2012

1008A-3SE-01APR2012

1008A-3NE-01APR2012

1008B-2-01APR2012

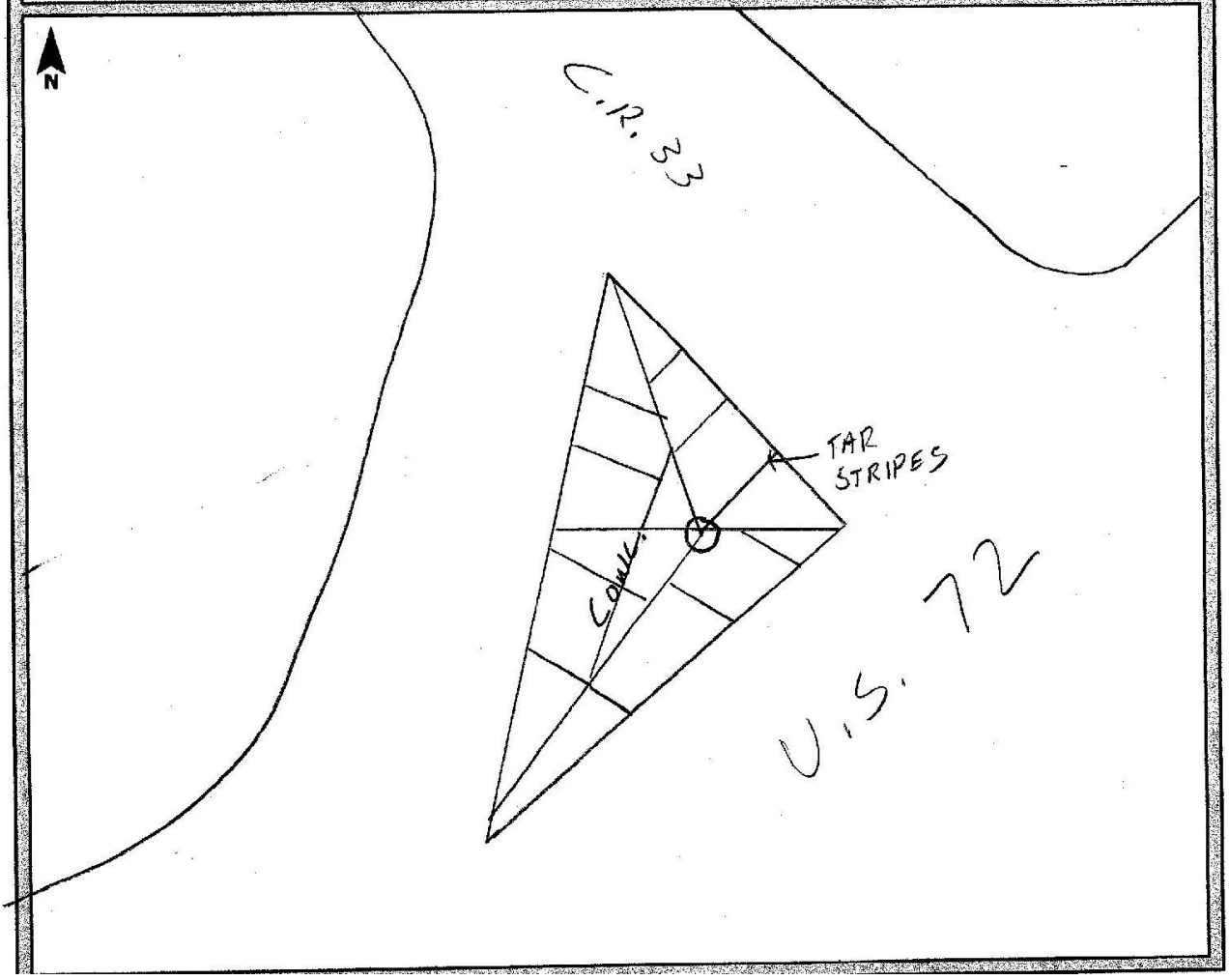
1008B-3N-01APR2012

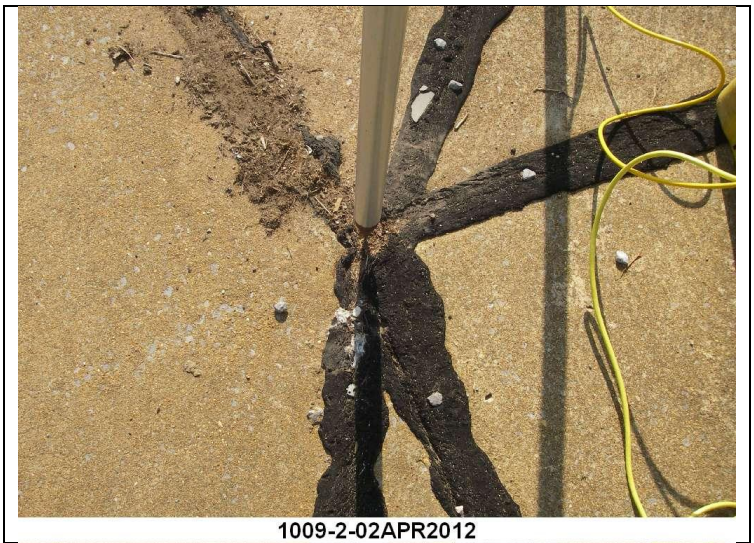
1008B-3E-01APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	Jackson, Marshall and DeKalb Counties, AL	**Project Number:**	71899 **Survey Date:** 4/2/12
Station Name:	1009	**Operator Name:**	Josh Nave
Latitude:	N 34-43-07.352	**Julian Day:**	093 **Session No.** ROVER
Longitude:	W85-57-29.525	**Start Time:**	4:09PM **End Time:** 5:48PM
Ellip. Height:	540.35 FT	**Data File Name:**	1009093A
Type of Mark:	PID	**Type of Reciever:**	Trimble 4000 SSI
Stamping on Mark:	N/A	**Type of Antenna:**	Trimble M/L L1/L2
Weather Condition:		**Antenna Height:**	5.906FT to bottom of antenna mount





1009-2-02APR2012

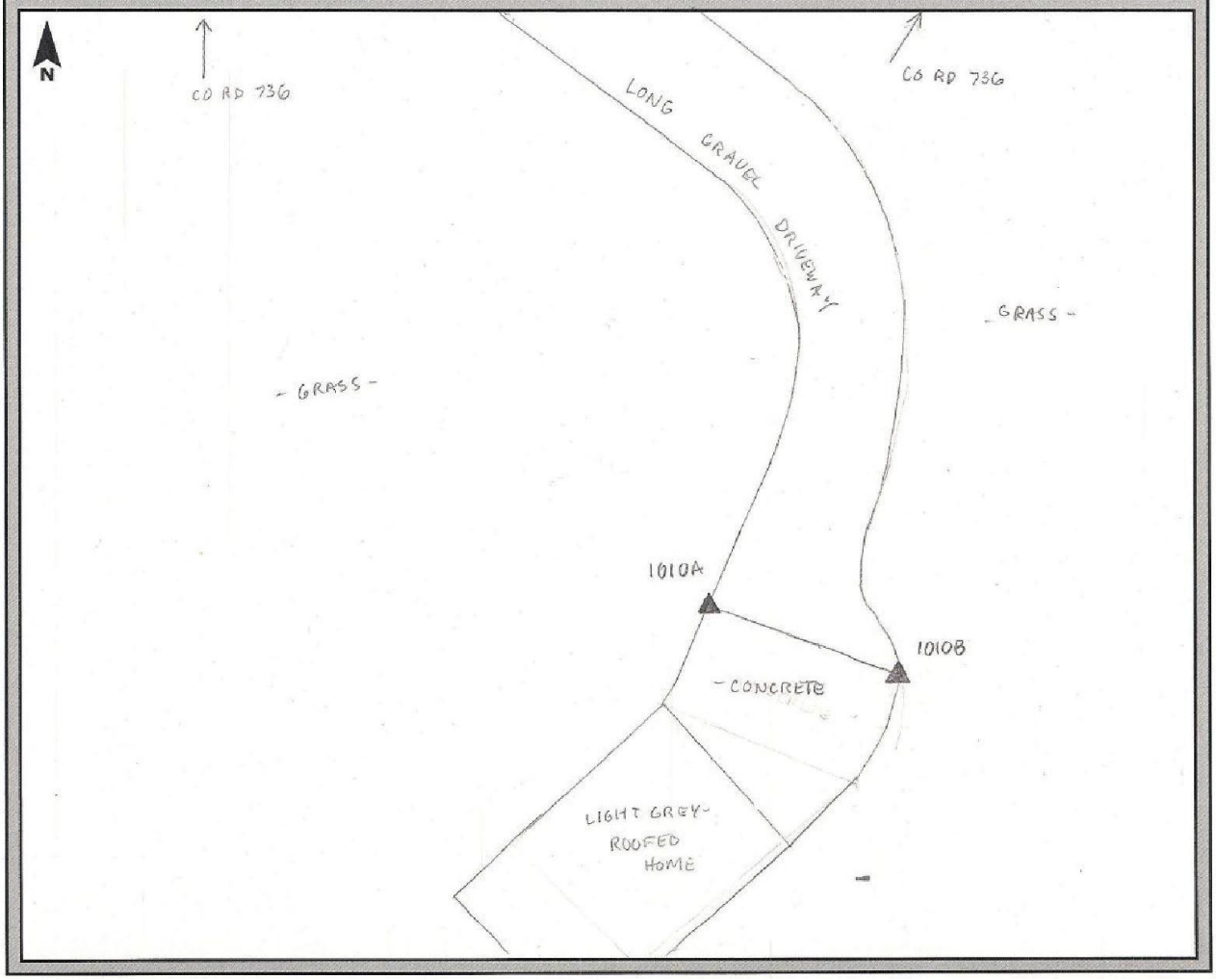
1009-3NW-02APR2012

1009-3SW-02APR2012

GPS Observation Log Sheet

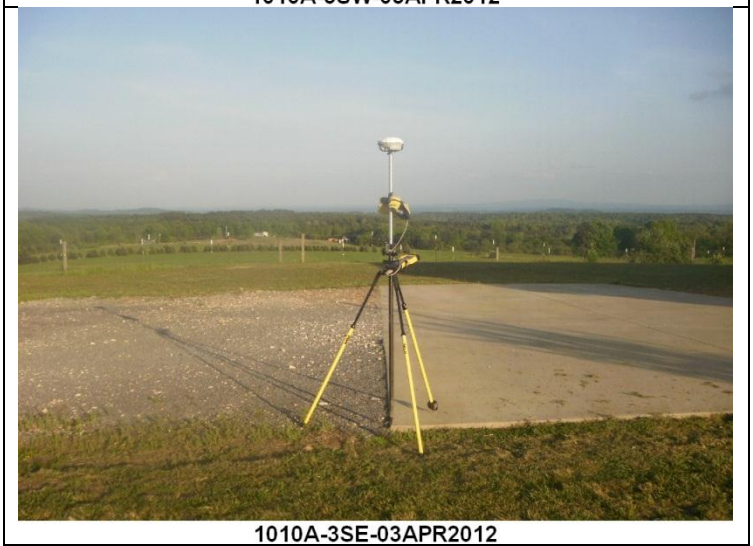
WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:**	71899
Survey Date:	4/3/2012		
Station Name:	1010A / 1010B	**Operator Name:**	Cody Schneider
Latitude:	N34°16'15.63" / N34°16'15.40"	**Julian Day:**	94
Session No.	N/A		
Longitude:	W85°45'57.72" / W85°45'57.19"	**Start Time:**	18:03 / 18:08
End Time:	18:07 / 18:13		
Ellip. Height:	317.4 m / 316.8 m	**Data File Name:**	AL_LIDAR_94_CJS
Type of Mark:	Marked points	**Type of Reciever:**	R8-3 #0364
Stamping on Mark:	N/A	**Type of Antenna:**	R8-3 #0364
Weather Condition:	Partly Cloudy ~ 78°	**Antenna Height:**	2.00 m to bottom of antenna mount



1010A-2-03APR2012

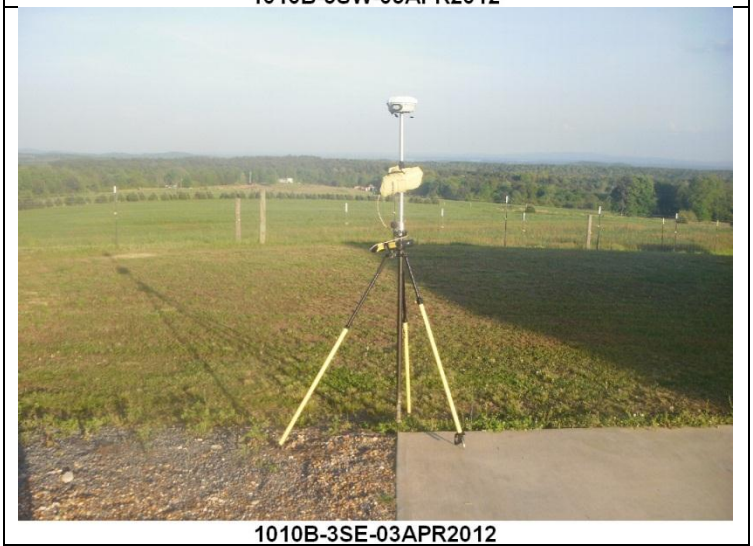
1010A-3SW-03APR2012



1010A-3SE-03APR2012

1010B-2-03APR2012

1010B-3SW-03APR2012

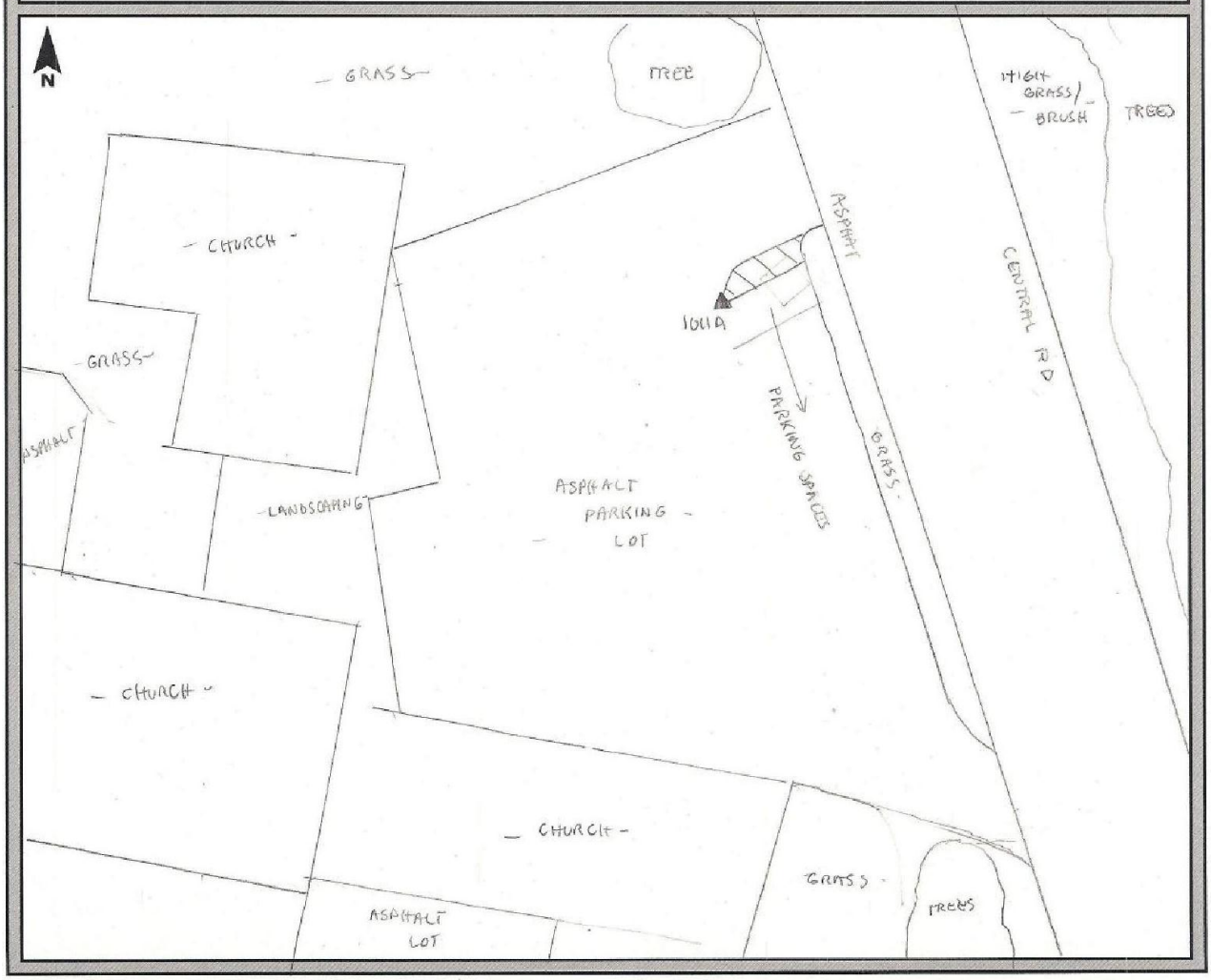


1010B-3SE-03APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:**	71899
Survey Date:	4/3/2012		
Station Name:	IOLIA	**Operator Name:**	Cody Schneider
Latitude:	N34° 38' 16.12"	**Julian Day:**	94
Session No.	N/A		
Longitude:	W85° 46' 10.96"	**Start Time:**	13:29
End Time:	13:34		
Ellip. Height:	410.1 m	**Data File Name:**	AL_LiDAR_94_CJS
Type of Mark:	Mag Nail	**Type of Reciever:**	R8-3 #0364
Stamping on Mark:	N/A	**Type of Antenna:**	R8-3 #0364
Weather Condition:	Partly Cloudy ≈80°	**Antenna Height:**	2.00 m to bottom of antenna mount



1011A-2-03APR2012

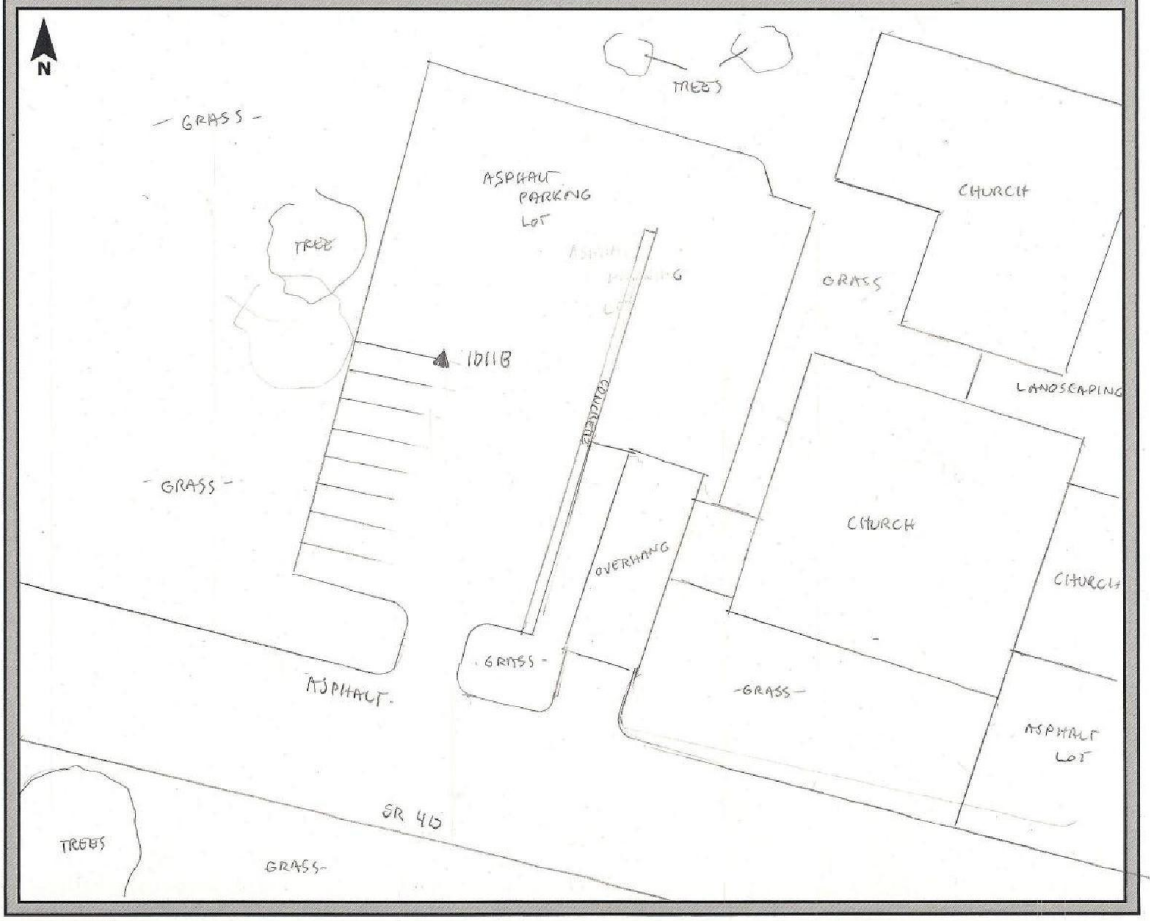
1011A-3N-03APR2012

1011A-3E-03APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:**	71899
Survey Date:	4/3/2012		
Station Name:	1011B	**Operator Name:**	Cody Schneider
Latitude:	N34° 38' 14.55"	**Julian Day:**	94
Session No.	N/A		
Longitude:	W85° 46' 15.61"	**Start Time:**	13:40
End Time:	13:45		
Ellip. Height:	410.9 m	**Data File Name:**	AL-LIDAR-94-COS
Type of Mark:	Mag Nail	**Type of Reciever:**	R8-3 #0364
Stamping on Mark:	N/A	**Type of Antenna:**	R8-3 #0364
Weather Condition:	Partly Cloudy ≈ 80°	**Antenna Height:**	2.00m to bottom of antenna mount



1011B-2-03APR2012

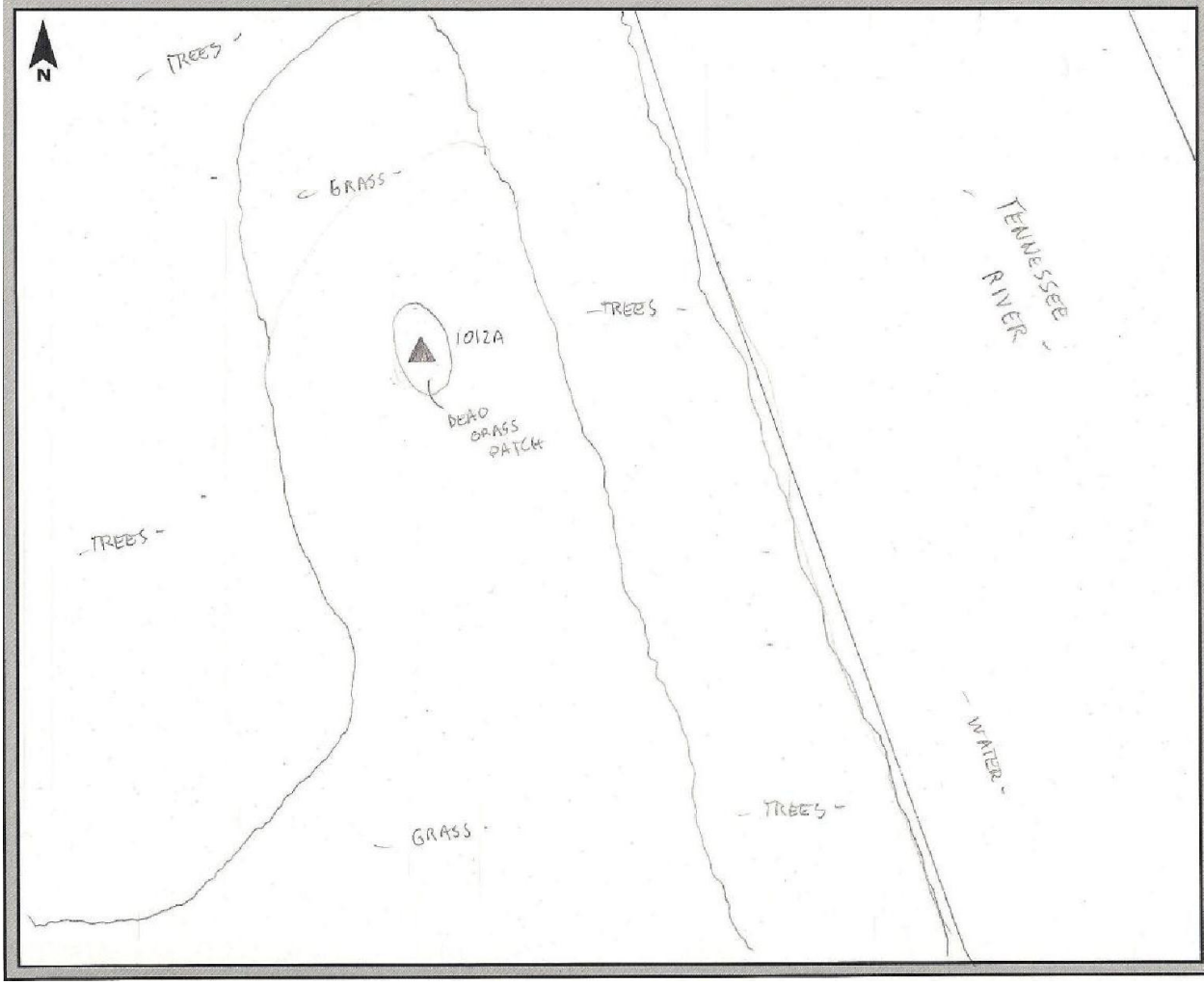
1011B-3W-03APR2012

1011B-3S-03APR2012

GPS Observation Log Sheet

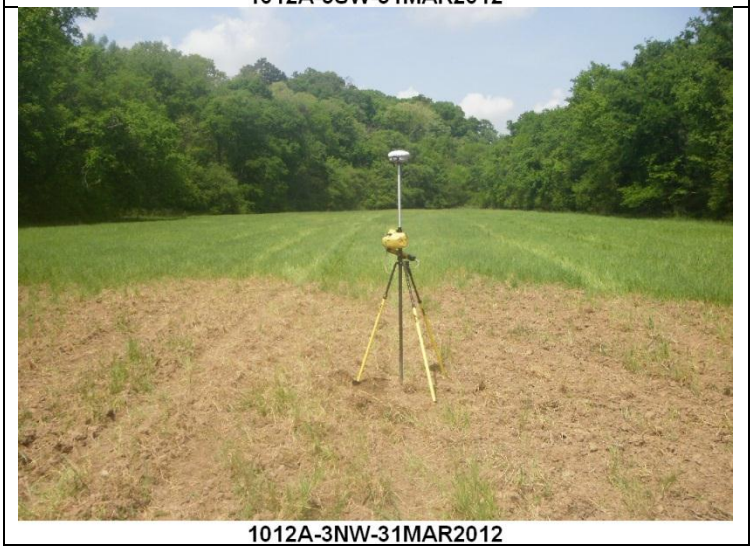
WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:**	71849
Survey Date:	3/3/2012		
Station Name:	1012A	**Operator Name:**	Cody Schneider
Latitude:	N34° 31' 35.10"	**Julian Day:**	91
Session No.	N/A		
Longitude:	W86° 32' 45.76"	**Start Time:**	12:57
End Time:	13:02		
Ellip. Height:	144.5 m	**Data File Name:**	AL_LIDAR_91_CJS
Type of Mark:	Rebar w/ cap	**Type of Reciever:**	R8-3 #0364
Stamping on Mark:	N/A	**Type of Antenna:**	R8-3 #0364
Weather Condition:	Partly Cloudy ≈ 72°	**Antenna Height:**	2.00 m to bottom of antenna mount



1012A-2-31MAR2012

1012A-3SW-31MAR2012

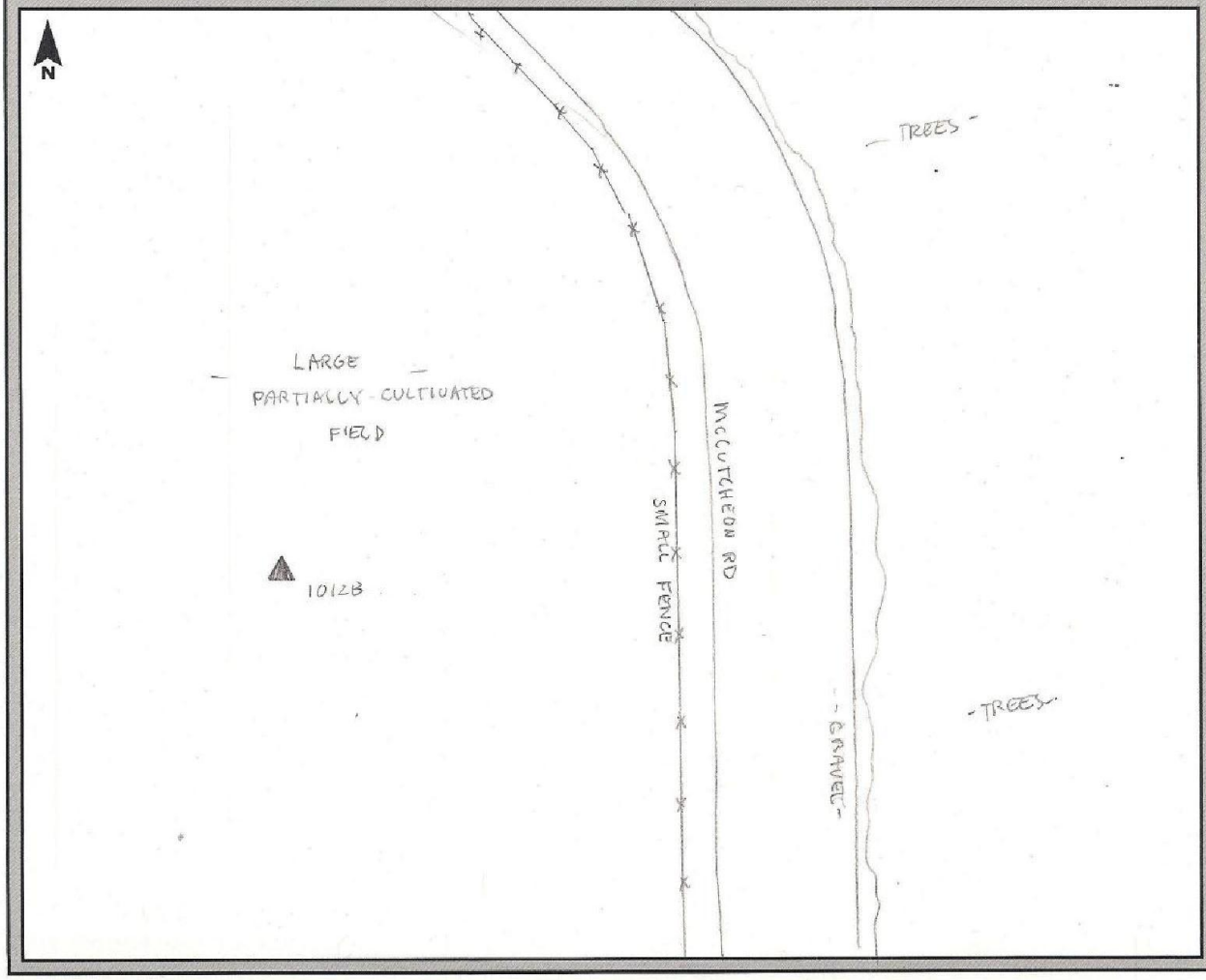


1012A-3NW-31MAR2012

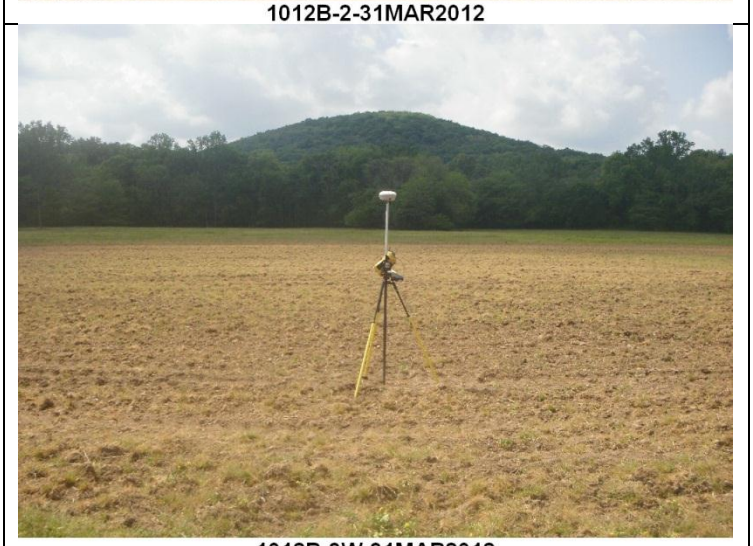
GPS Observation Log Sheet

WOOLPERT

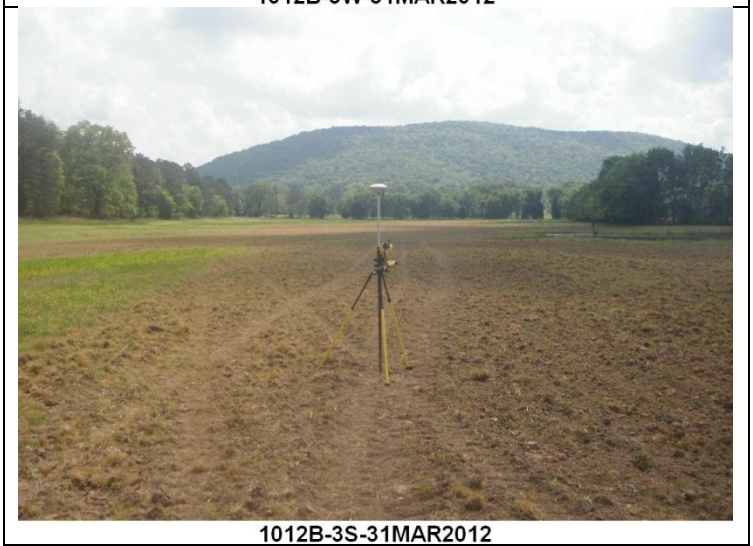
Project Name:	5 Co AL LiDAR	**Project Number:**	71899
Survey Date:	3/31/2012		
Station Name:	1012B	**Operator Name:**	Cody Schneider
Latitude:	N34° 31' 52.98"	**Julian Day:**	91
Session No.	N/A		
Longitude:	W86° 33' 05.11"	**Start Time:**	13:22
End Time:	13:34		
Ellip. Height:	142.8 m	**Data File Name:**	AL_LIDAR_91.CJS
Type of Mark:	N/A	**Type of Reciever:**	R8-3 #0364
Stamping on Mark:	N/A	**Type of Antenna:**	R8-3 #0364
Weather Condition:	Partly Cloudy ≈ 72°	**Antenna Height:**	2.00 m to bottom of antenna mount



1012B-2-31MAR2012



1012B-3W-31MAR2012

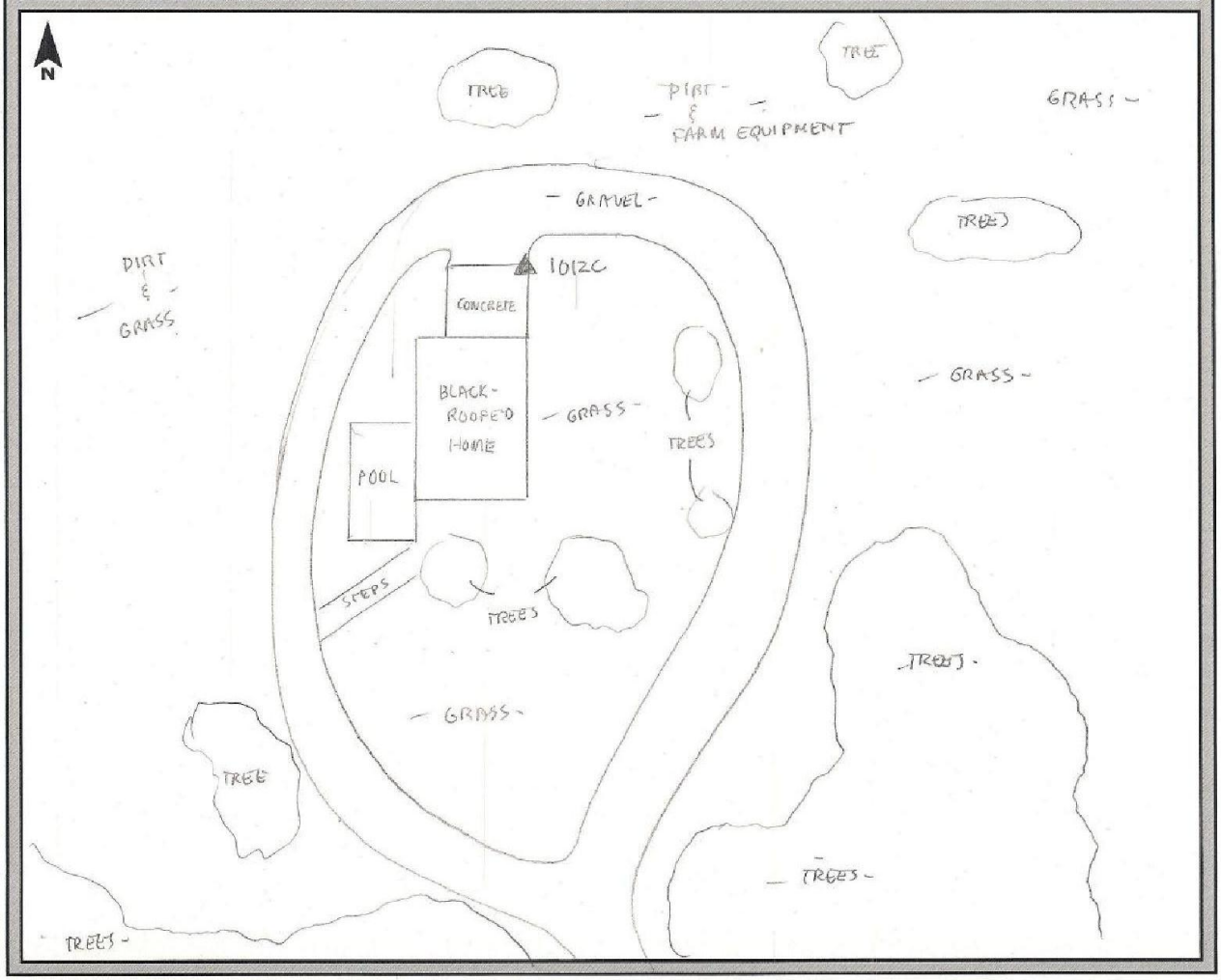


1012B-3S-31MAR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:**	71899
Survey Date:	3/31/2012		
Station Name:	1012C	**Operator Name:**	Cody Schneider
Latitude:	N34° 29' 23.00"	**Julian Day:**	91
Session No.	N/A		
Longitude:	W86° 32' 28.30"	**Start Time:**	14:19
End Time:	14:23		
Ellip. Height:	154.7 m	**Data File Name:**	AL_LIDAR_91_CJS
Type of Mark:	Marked point	**Type of Reciever:**	R8-3 #0364
Stamping on Mark:	N/A	**Type of Antenna:**	R8-3 #0364
Weather Condition:	Mostly Cloudy ≈ 74°	**Antenna Height:**	2.00 to bottom of antenna mount



1012C-2-31MAR2012

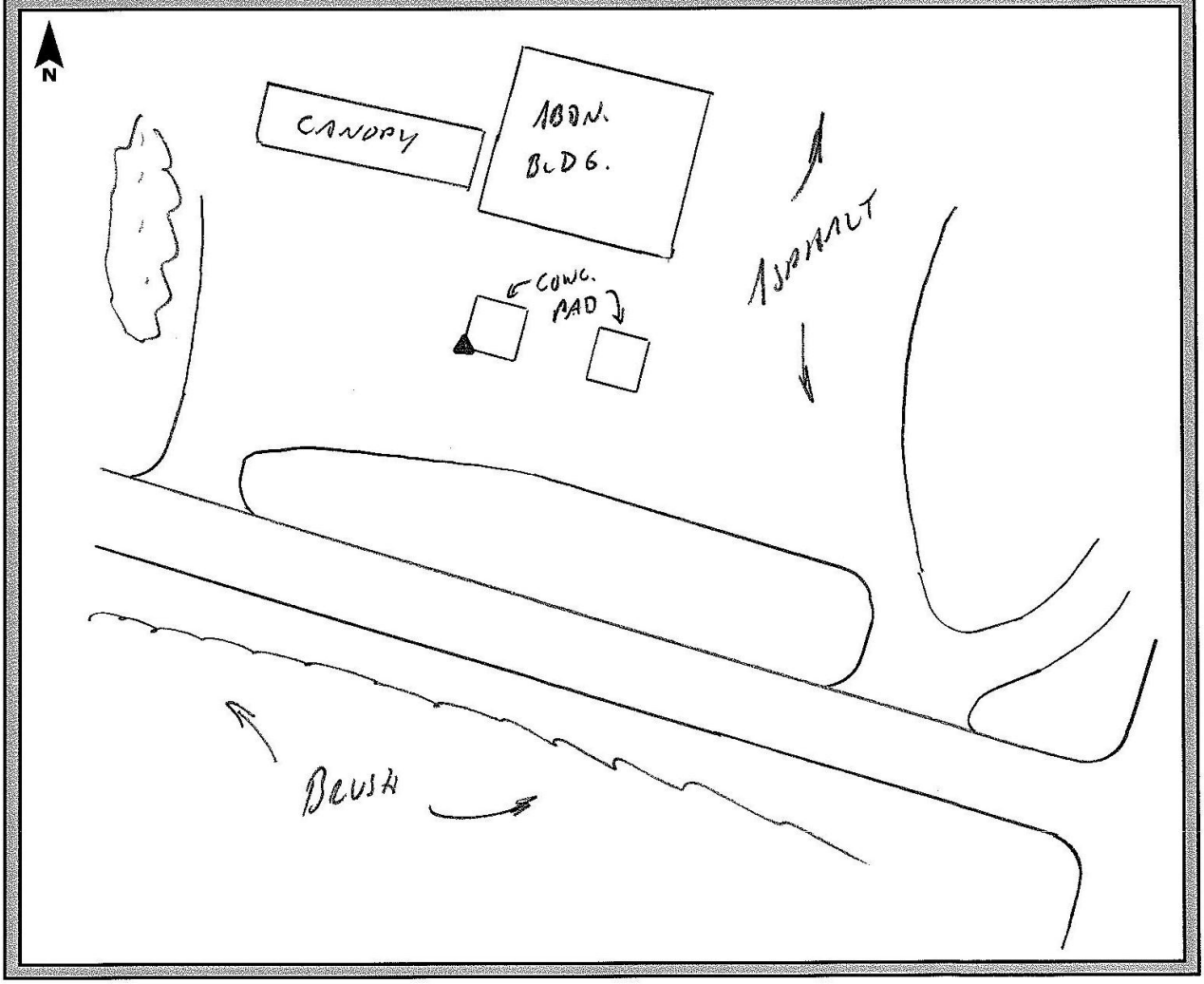
1012C-3E-31MAR2012

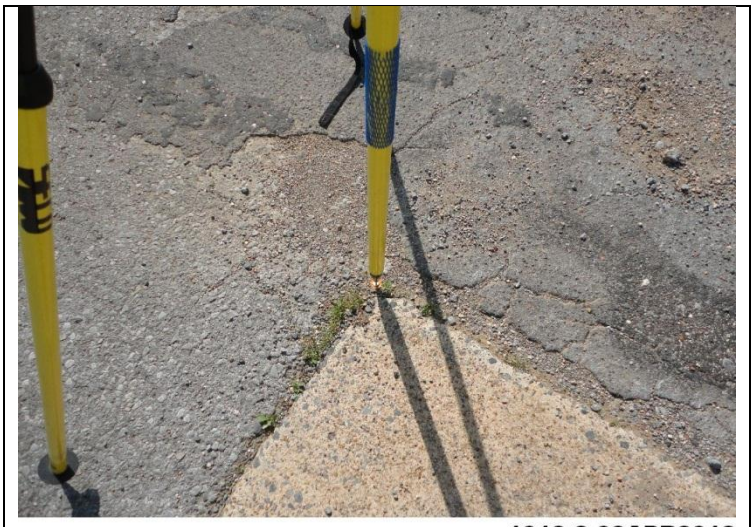
1012C-3S-31MAR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	LIDAR QC - ALA 3 COUNTY	Project Number:	71899
Survey Date:	4-3-12		
Station Name:	1013	Operator Name:	J SPEELMAN
Latitude:	34° 41' 45.86"	Julian Day:	094
Session No.			
Longitude:	85° 39' 00.23"	Start Time:	
End Time:			
Ellip. Height:	776.099'	Data File Name:	ALABAMA2012.DC (CATK)
Type of Mark:	MAG NAIL (PID)	Type of Reciever:	TRIMBLE R8-2
Stamping on Mark:	N/A	Type of Antenna:	INTERNAL
Weather Condition:	PC 80°	Antenna Height:	2.0 ~ to bottom of antenna mount





1013-2-03APR2012

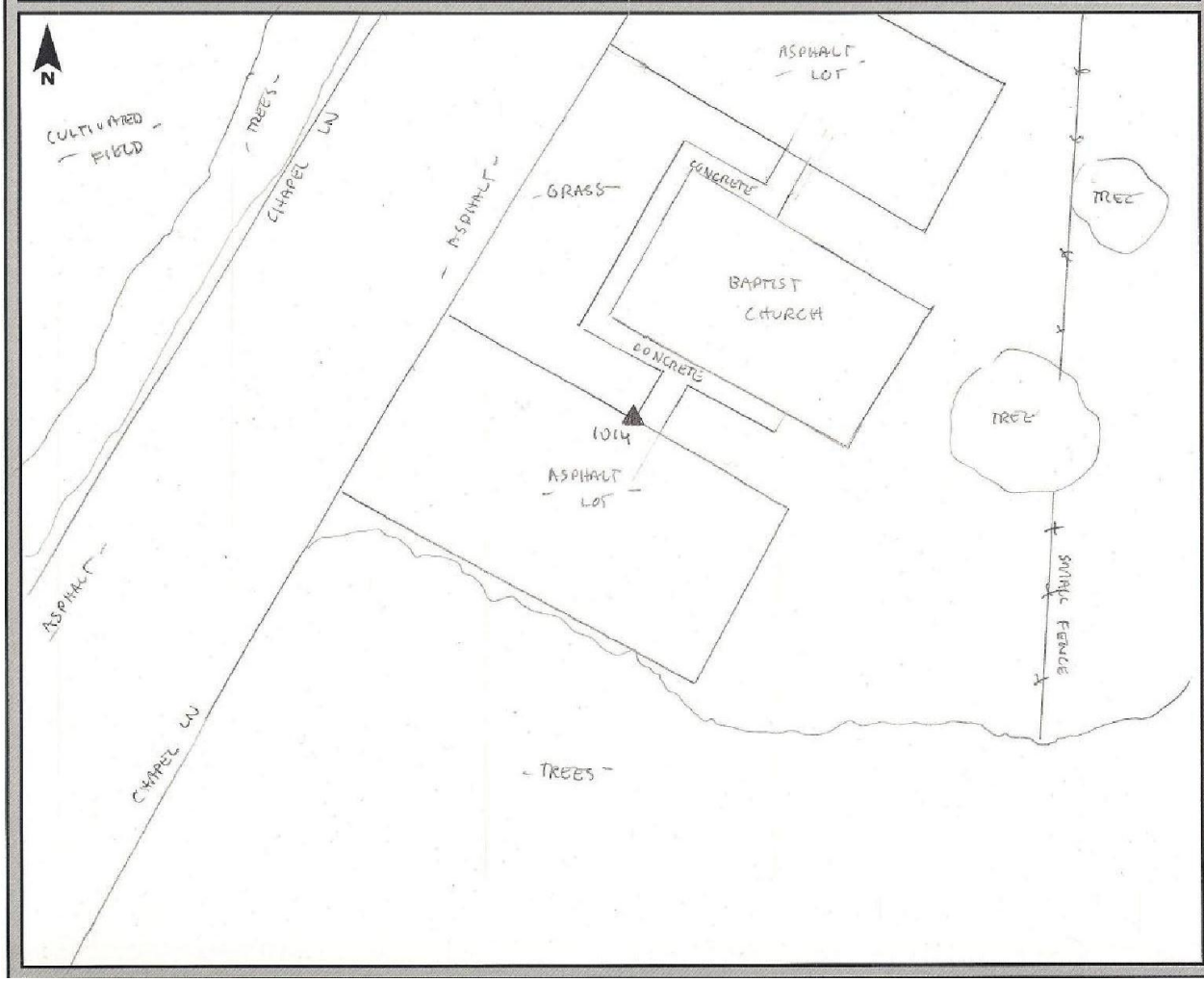
1013-3SE-03APR2012

1013-3NE-03APR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:**	71899	**Survey Date:**	3/31/2012
Station Name:	1014	**Operator Name:**	Cody Schneider		
Latitude:	N 34° 36' 01.29"	**Julian Day:**	91	**Session No.**	N/A
Longitude:	W 86° 10' 00.20"	**Start Time:**	16:17	**End Time:**	16:22
Ellip. Height:	374.6 m	**Data File Name:**	AL_LIDAR_91_CJS		
Type of Mark:	Marked point	**Type of Reciever:**	R8-3 #0364		
Stamping on Mark:	N/A	**Type of Antenna:**	R8-3 #0364		
Weather Condition:	Mostly Cloudy & 75°	**Antenna Height:**	2.00m	to bottom of antenna mount	



1014-2-31MAR2012

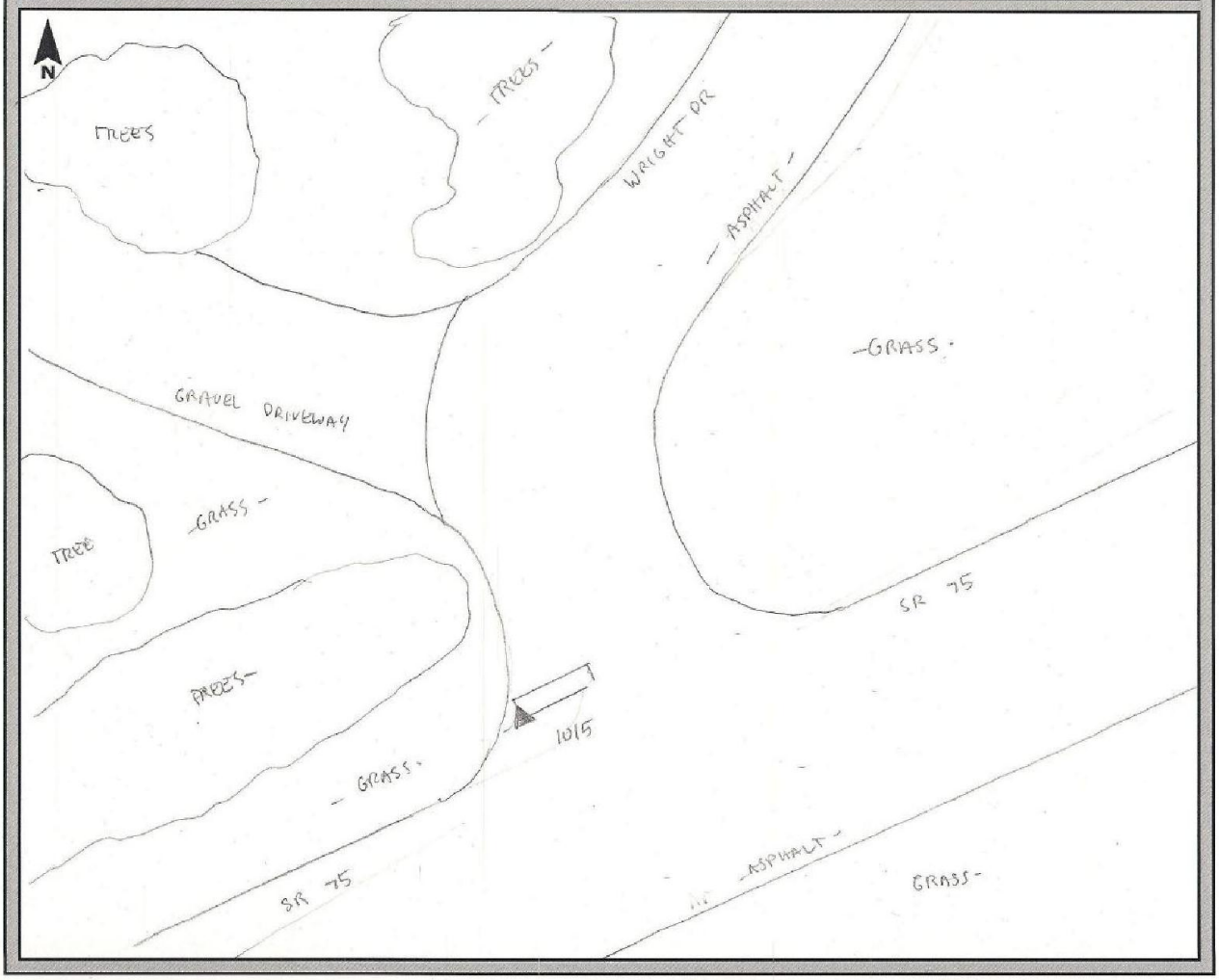
1014-3SE-31MAR2012

1014-3NE-31MAR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:** 71899	**Survey Date:** 3/28/2012
Station Name:	1015	**Operator Name:**	Cody Schneider
Latitude:	N34°09'40.31"	**Julian Day:** 88	**Session No.** N/A
Longitude:	W86°20'49.90"	**Start Time:** 15:19	**End Time:** 15:23
Ellip. Height:	250.2 m	**Data File Name:**	AL_LIDAR_88_CJS
Type of Mark:	Mag Nail	**Type of Reciever:**	R8-3 #0364
Stamping on Mark:	N/A	**Type of Antenna:**	R8-3 #0364
Weather Condition:	Partly Cloudy 73°	**Antenna Height:**	2.00 m to bottom of antenna mount



1015-2-28MAR2012

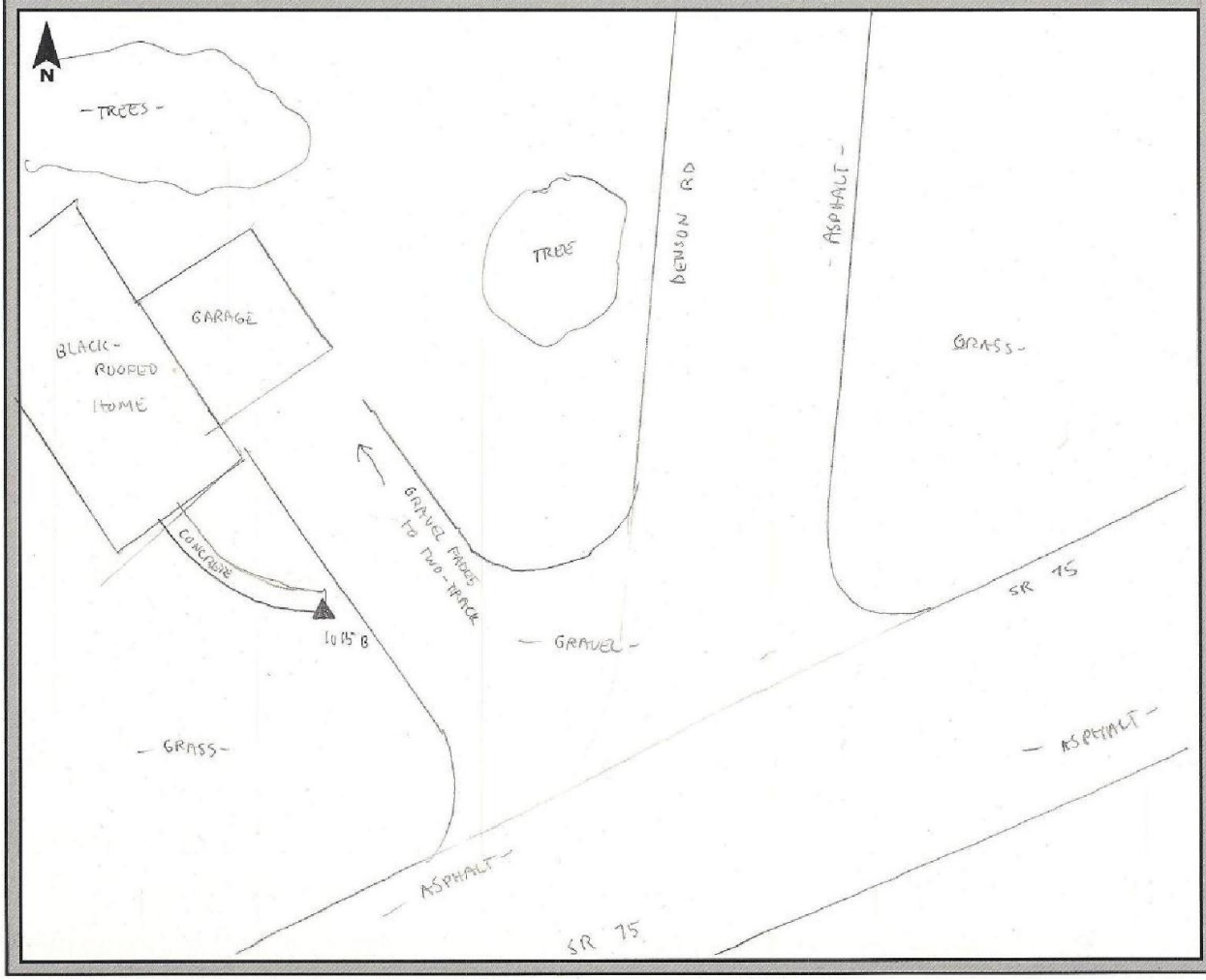
1015-3SW-28MAR2012

1015-3SE-28MAR2012

GPS Observation Log Sheet

WOOLPERT

Project Name:	5 Co AL LiDAR	**Project Number:**	71894
Survey Date:	3/29/2012		
Station Name:	1015_B	**Operator Name:**	Cody Schneider
Latitude:	N 34° 09' 52.48	**Julian Day:**	89
Session No.	N/A		
Longitude:	W 86° 20' 26.10"	**Start Time:**	17:23
End Time:	17:28		
Ellip. Height:	251.5 m	**Data File Name:**	AL_LIDAR_89_05
Type of Mark:	Marked point	**Type of Reciever:**	R8-3 #0364
Stamping on Mark:	N/A	**Type of Antenna:**	R8-3 #0364
Weather Condition:	Partly Cloudy ≈70°	**Antenna Height:**	2.00 to bottom of antenna mount



1015B-2-29MAR2012

1015B-3SW-29MAR2012

1015B-3N-29MAR2012

SECTION 4: EXISTING NGS DATA SHEETS

This section contains the published National Geodetic Survey (NGS) Data Sheets used in the final control network for this project.

```
EF1323 ********************************************************************
 EF1323  DESIGNATION -  K 476
 EF1323  PID        -  EF1323
 EF1323  STATE/COUNTY-  AL/JACKSON
 EF1323  USGS QUAD   -  SCOTTSBORO (1982)
 EF1323
 EF1323                  *CURRENT SURVEY CONTROL
 EF1323  ______________________________________________________________________
 EF1323* NAD 83(2007)-  34 41 11.24641(N)    086 06 00.75733(W)     NO CHECK
 EF1323* NAVD 88     -      199.475  (meters)    654.44   (feet)  ADJUSTED
 EF1323  ______________________________________________________________________
 EF1323  EPOCH DATE  -       2002.00
 EF1323  X          -    357,090.983 (meters)                COMP
 EF1323  Y          - -5,238,282.947 (meters)                COMP
 EF1323  Z          -  3,609,416.418 (meters)                COMP
 EF1323  LAPLACE CORR-         -0.64  (seconds)              DEFLEC09
 EF1323  ELLIP HEIGHT-        170.622 (meters)        (02/10/07) NO CHECK
 EF1323  GEOID HEIGHT-         -28.86  (meters)              GEOID09
 EF1323  DYNAMIC HT  -         199.276 (meters)    653.79  (feet)  COMP
 EF1323
 EF1323  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 EF1323  Type    PID    Designation                 North   East  Ellip
 EF1323  ----------------------------------------------------------------
 EF1323  NETWORK EF1323 K 476                      1.20   0.80   3.10
 EF1323  ----------------------------------------------------------------
 EF1323  MODELED GRAV-     979,635.3   (mgal)                NAVD 88
 EF1323
 EF1323  VERT ORDER  -  FIRST     CLASS II
 EF1323
 EF1323.The horizontal coordinates were established by GPS observations
 EF1323.and adjusted by the National Geodetic Survey in February 2007.
 EF1323
 EF1323.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 EF1323.See National Readjustment for more information.
 EF1323
 EF1323.The horizontal coordinates are valid at the epoch date displayed above
 EF1323.which is a decimal equivalence of Year/Month/Day.
 EF1323
 EF1323.No horizontal observational check was made to the station.
 EF1323.
 EF1323.The orthometric height was determined by differential leveling and
 EF1323.adjusted in June 1991.
 EF1323
 EF1323.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 EF1323
 EF1323.The Laplace correction was computed from DEFLEC09 derived deflections.
 EF1323
 EF1323.The ellipsoidal height was determined by GPS observations
 EF1323.and is referenced to NAD 83.
 EF1323
 EF1323.The geoid height was determined by GEOID09.
 EF1323
```

EF1323.The dynamic height is computed by dividing the NAVD 88
EF1323.geopotential number by the normal gravity value computed on the
EF1323.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
EF1323.degrees latitude (g = 980.6199 gals.).
EF1323
EF1323.The modeled gravity was interpolated from observed gravity values.
EF1323
EF1323; North East Units Scale Factor Converg.
EF1323;SPC AL E - 464,281.305 175,545.664 MT 0.99996737 -0 09 06.8
EF1323;UTM 16 - 3,838,641.591 582,420.464 MT 0.99968373 +0 30 43.5
EF1323
EF1323! - Elev Factor x Scale Factor = Combined Factor
EF1323!SPC AL E - 0.99997322 x 0.99996737 = 0.99994059
EF1323!UTM 16 - 0.99997322 x 0.99968373 = 0.99965696
EF1323
EF1323 SUPERSEDED SURVEY CONTROL
EF1323
EF1323 ELLIP H (08/18/03) 170.640 (m) GP( ) 3 1
EF1323 NAD 83(1992)- 34 41 11.24606(N) 086 06 00.75783(W) AD( ) 1
EF1323 ELLIP H (01/10/02) 170.631 (m) GP( ) 3 1
EF1323 NAVD 88 (01/10/02) 199.48 (m) 654.5 (f) LEVELING 3
EF1323
EF1323.Superseded values are not recommended for survey control.
EF1323.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
EF1323.See file dsdata.txt to determine how the superseded data were derived.
EF1323
EF1323_U.S. NATIONAL GRID SPATIAL ADDRESS: 16SED8242038641(NAD 83)
EF1323
EF1323_MARKER: DB = BENCH MARK DISK
EF1323_SETTING: 66 = SET IN ROCK OUTCROP
EF1323_SP_SET: ROCK OUTCROP
EF1323_STAMPING: K 476 1983
EF1323_MARK LOGO: NGS
EF1323_MAGNETIC: O = OTHER; SEE DESCRIPTION
EF1323_STABILITY: A = MOST RELIABLE AND EXPECTED TO HOLD
EF1323+STABILITY: POSITION/ELEVATION WELL
EF1323_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
EF1323+SATELLITE: SATELLITE OBSERVATIONS - April 13, 2001
EF1323
EF1323 HISTORY - Date Condition Report By
EF1323 HISTORY - 1983 MONUMENTED NGS
EF1323 HISTORY - 20010401 GOOD NGS
EF1323 HISTORY - 20010413 GOOD NGS
EF1323
EF1323 STATION DESCRIPTION
EF1323
EF1323'DESCRIBED BY NATIONAL GEODETIC SURVEY 1983
EF1323'6.3 KM (3.9 MI) WEST FROM SCOTTSBORO.
EF1323'6.3 KM (3.9 MI) WESTERLY ALONG STATE HIGHWAY 35 FROM THE POST OFFICE
EF1323'IN SCOTTSBORO, AT THE NORTHWEST ANGLE OF THE INTERSECTION WITH STATE
EF1323'HIGHWAY 79, SET IN BEDROCK, 56.84 METERS (186.5 FT) NORTH OF THE
EF1323'CENTERLINE OF STATE HIGHWAY 35, 15.12 METERS (49.6 FT) WEST OF THE

EF1323'CENTERLINE OF STATE HIGHWAY 79 SOUTHBOUND, 12.92 METERS (42.4 FT)
EF1323'SOUTH-SOUTHWEST OF THE SOUTHWEST EDGE OF THE WEST WINGWALL OF A SMALL
EF1323'CULVERT UNDER STATE HIGHWAY 79, AND 7.92 METERS (26.0 FT)
EF1323'EAST-SOUTHEAST OF A POWERLINE POLE.
EF1323'THE MARK IS 1.3 METERS W FROM A WITNESS POST.
EF1323'THE MARK IS ABOVE LEVEL WITH STATE HIGHWAY 79.
EF1323
EF1323 STATION RECOVERY (2001)
EF1323
EF1323'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2001 (AJL)
EF1323'THIS STATION IS 3.9 MILES WEST OF SCOTSBORO IN THE NORTHWEST QUADRANT
EF1323'OF THE JUNCTION OF STATE
EF1323'HIGHWAYS 79 AND 35. THE STATION IS SET IN A BEDROCK OUTCROP.
EF1323'TO REACH THE STATION FROM THE JUNCTION U.S. HIGHWAYS 72 AND STATE
EF1323'HIGHWAY 79. GO NORTH ON
EF1323'STATE HIGHWAY 79 FOR 4.75 MILES TO THE JUNCTION OF STATE HIGHWAYS 35
EF1323'AND STATION AS DESCRIBED.
EF1323'
EF1323'THE STATION IS 186.5 FEET NORTH OF THE CENTERLINE OF STATE HIGHWAY 35,
EF1323'49.6 FEET WEST OF THE
EF1323'CENTERLINE OF STATE HIGHWAY 79. 42.92 FEET SOUTH SOUTHEAST OF THE
EF1323'SOUTHWEST EDGE OF THE WEST
EF1323'WINGWALL OF A SMALL CULVERT UNDER STATE HIGHWAY 79 AND 24.4 FEET EAST
EF1323'SOUTEAST OF A POWER
EF1323'POLE. THE MARK IS ABOVE THE LEVEL OF THE HIGHWAY. THE STATION IS A
EF1323'STANDARD NGS VERTICAL BENCH
EF1323'MARK CEMENTED INTO BEDROCK.
EF1323'
EF1323
EF1323 STATION RECOVERY (2001)
EF1323
EF1323'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2001 (RTN)
EF1323'RECOVERED IN GOOD CONDITION.

BH0024 **********
BH0024 DESIGNATION - Q 120
BH0024 PID - BH0024
BH0024 STATE/COUNTY- AL/MOBILE
BH0024 COUNTRY - US
BH0024 USGS QUAD - KUSHLA (1982)
BH0024
BH0024 *CURRENT SURVEY CONTROL
BH0024 _____
BH0024* NAD 83(1986) POSITION- 30 47 37. (N) 088 08 39. (W) SCALED
BH0024* NAVD 88 ORTHO HEIGHT - 5.710 (meters) 18.73 (feet) POSTED
BH0024 _____
BH0024 GEOID HEIGHT - -28.61 (meters) GEOID09
BH0024 DYNAMIC HEIGHT - 5.70 (meters) 18.7 (feet) COMP
BH0024 MODELED GRAVITY - 979,336.1 (mgal) NAVD 88
BH0024
BH0024 VERT ORDER - * POSTED, Code A , SEE BELOW
BH0024
BH0024.The horizontal coordinates were scaled from a topographic map and have
BH0024.an estimated accuracy of +/- 6 seconds.
BH0024.
BH0024.The orthometric height was determined by differential leveling
BH0024.and adjusted by the in 1992.
BH0024
BH0024.* This is a POSTED BENCH MARK height. Code A indicates a distribution
BH0024.rate of 0.0 thru 1.0 mm/km.
BH0024
BH0024.The dynamic height is computed by dividing the NAVD 88
BH0024.geopotential number by the normal gravity value computed on the
BH0024.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
BH0024.degrees latitude (g = 980.6199 gals.).
BH0024
BH0024.The modeled gravity was interpolated from observed gravity values.
BH0024
BH0024; North East Units Estimated Accuracy
BH0024;SPC AL W - 88,150. 538,350. MT (+/- 180 meters Scaled)
BH0024
BH0024 SUPERSEDED SURVEY CONTROL
BH0024
BH0024 NGVD 29 (??/??/??) 5.736 (m) 18.82 (f) ADJUSTED 1 2
BH0024
BH0024.Superseded values are not recommended for survey control.
BH0024.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
BH0024.See file dsdata.txt to determine how the superseded data were derived.
BH0024
BH0024_U.S. NATIONAL GRID SPATIAL ADDRESS: 16RCV905072(NAD 83)
BH0024
BH0024_MARKER: DB = BENCH MARK DISK
BH0024_SETTING: 30 = SET IN A LIGHT STRUCTURE
BH0024_SP_SET: TREE
BH0024_STAMPING: Q-120 1940
BH0024_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY

BH0024
BH0024 HISTORY - Date Condition Report By
BH0024 HISTORY - 1940 MONUMENTED CGS
BH0024
BH0024 STATION DESCRIPTION
BH0024
BH0024'DESCRIBED BY COAST AND GEODETIC SURVEY 1940
BH0024'4 MI NW FROM WHISTLER.
BH0024'4 MILES NORTH-WEST ALONG THE GULF, MOBILE AND OHIO RAILROAD FROM THE
BH0024'STATION AT WHISTLER, 9 RAILS SOUTH OF MILE-POST NO. 9, 1.5 POLES
BH0024'SOUTH OF MILE-POST NO. 9, 54.4 FEET WEST OF CENTER-LINE OF TRACK, 115
BH0024'FEET NORTH-WEST OF TELEPHONE POLE NO. 4720, 96.5 FEET NORTH-WEST OF
BH0024'TELEGRAPH POLE SOUTH OF MILE-POST NO. 9, 6 FEET WEST OF R/W FENCE, A
BH0024'STANDARD DISK STAMPED Q-120 1940, SET VERTICALLY IN TREE, 4 FEET
BH0024'ABOVE GROUND.

```
EE1500 **********************************************************************
 EE1500  DESIGNATION -  X 479
 EE1500  PID        -  EE1500
 EE1500  STATE/COUNTY-  AL/JACKSON
 EE1500  USGS QUAD   -  DORAN COVE (1988)
 EE1500
 EE1500                  *CURRENT SURVEY CONTROL
 EE1500 ______________________________________________________________________
 EE1500* NAD 83(1986)-  34 54 50.     (N)    085 46 25.     (W)     SCALED
 EE1500* NAVD 88     -      190.062  (meters)     623.56   (feet)  ADJUSTED
 EE1500 ______________________________________________________________________
 EE1500  GEOID HEIGHT-        -28.94  (meters)                GEOID09
 EE1500  DYNAMIC HT -        189.875 (meters)     622.95  (feet)  COMP
 EE1500  MODELED GRAV-     979,651.5   (mgal)                  NAVD 88
 EE1500
 EE1500  VERT ORDER  -  FIRST     CLASS II
 EE1500
 EE1500.The horizontal coordinates were scaled from a topographic map and have
 EE1500.an estimated accuracy of +/- 6 seconds.
 EE1500.
 EE1500.The orthometric height was determined by differential leveling and
 EE1500.adjusted in June 1991.
 EE1500
 EE1500.Photographs  are available for this station.
 EE1500
 EE1500.The geoid height was determined by GEOID09.
 EE1500
 EE1500.The dynamic height is computed by dividing the NAVD 88
 EE1500.geopotential number by the normal gravity value computed on the
 EE1500.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 EE1500.degrees latitude (g = 980.6199 gals.).
 EE1500
 EE1500.The modeled gravity was interpolated from observed gravity values.
 EE1500
 EE1500;               North        East    Units  Estimated Accuracy
 EE1500;SPC AL E     -  489,480.      205,460.      MT  (+/- 180 meters Scaled)
 EE1500
 EE1500                    SUPERSEDED SURVEY CONTROL
 EE1500
 EE1500.No superseded survey control is available for this station.
 EE1500
 EE1500_U.S. NATIONAL GRID SPATIAL ADDRESS: 16SFD120641(NAD 83)
 EE1500
 EE1500_MARKER: I = METAL ROD
 EE1500_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)
 EE1500_SP_SET: STAINLESS STEEL ROD
 EE1500_STAMPING: X 479 1983
 EE1500_MARK LOGO: NGS
 EE1500_PROJECTION: RECESSED 5 CENTIMETERS
 EE1500_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 EE1500_ROD/PIPE-DEPTH: 16.5 meters
 EE1500
```

EE1500 HISTORY - Date Condition Report By
EE1500 HISTORY - 1983 MONUMENTED NGS
EE1500 HISTORY - 20090310 GOOD JCLS
EE1500 HISTORY - 20100415 GOOD JCLS
EE1500 HISTORY - 20110418 GOOD JCLS
EE1500
EE1500 STATION DESCRIPTION
EE1500
EE1500'DESCRIBED BY NATIONAL GEODETIC SURVEY 1983
EE1500'7.6 KM (4.75 MI) NE FROM STEVENSON.
EE1500'3.2 KM (2.0 MI) NORTHEASTERLY ALONG SECOND STREET FROM THE POST OFFICE
EE1500'IN STEVENSON, THENCE 4.4 KM (2.75 MI) NORTHEAST ALONG U.S. HIGHWAY 72,
EE1500'AT THE NORTH JACKSON HOSPITAL, ALSO, 0.1 KM (0.05 MI) SOUTHWEST ALONG
EE1500'A PAVED ROAD (DIAMOND AVENUE) FROM THE CHURCH OF CHRIST CHURCH IN
EE1500'BRIDGEPORT, THENCE 6.6 KM (4.1 MI) SOUTHWEST ALONG U.S. HIGHWAY 72,
EE1500'24.23 METERS (79.5 FT) SOUTH-SOUTHEAST OF THE CENTERLINE OF THE
EE1500'HIGHWAY, 63.73 METERS (209.1 FT) WEST-NORTHWEST OF THE NORTHWEST
EE1500'CORNER OF THE WESTERNMOST END OF THE HOSPITAL (SLOPE DISTANCE),
EE1500'20.76 METERS (68.1 FT) SOUTH-SOUTHWEST OF THE SOUTHWEST EDGE OF THE
EE1500'SOUTH END OF A WINGWALL OF A SMALL DOUBLE CULVERT, 7.47 METERS
EE1500'(24.5 FT) NORTHEAST OF THE CENTER OF A GRAVEL ROAD LEADING SOUTHEAST,
EE1500'AND 0.88 METERS (2.9 FT) NORTHWEST OF TELEPHONE CABLE POLE NUMBER
EE1500'3361. NOTE, THE ROD WAS DRIVEN TO REFUSAL.
EE1500'THE MARK IS 13.7 METERS SE FROM A WITNESS POST.
EE1500'THE MARK IS ABOVE LEVEL WITH HIGHWAY.
EE1500
EE1500 STATION RECOVERY (2009)
EE1500
EE1500'RECOVERY NOTE BY JOHN CHANCE LAND SURVEYS INC 2009
EE1500'RECOVERED IN GOOD CONDITION.
EE1500
EE1500 STATION RECOVERY (2010)
EE1500
EE1500'RECOVERY NOTE BY JOHN CHANCE LAND SURVEYS INC 2010
EE1500'RECOVERED IN GOOD CONDITION.
EE1500
EE1500 STATION RECOVERY (2011)
EE1500
EE1500'RECOVERY NOTE BY JOHN CHANCE LAND SURVEYS INC 2011
EE1500'RECOVERED IN GOOD CONDITION.

```
EE2309 ***************************************************************************
 EE2309  DESIGNATION -  25 10
 EE2309  PID        -  EE2309
 EE2309  STATE/COUNTY-  AL/DE KALB
 EE2309  USGS QUAD   -  CHAVIES (1983)
 EE2309
 EE2309                  *CURRENT SURVEY CONTROL
 EE2309  ______________________________________________________________________
 EE2309* NAD 83(2007)-  34 22 33.65398(N)    085 46 44.25782(W)     ADJUSTED
 EE2309* NAVD 88     -      273.54   (meters)     897.4    (feet)  N HEIGHT
 EE2309  ______________________________________________________________________
 EE2309  EPOCH DATE  -       2002.00
 EE2309  X          -    387,896.974 (meters)                COMP
 EE2309  Y          - -5,255,728.379 (meters)                COMP
 EE2309  Z          -  3,581,086.925 (meters)                COMP
 EE2309  LAPLACE CORR-          1.17  (seconds)              DEFLEC09
 EE2309  ELLIP HEIGHT-        244.740 (meters)         (02/10/07) ADJUSTED
 EE2309  GEOID HEIGHT-         -28.76  (meters)               GEOID09
 EE2309  DYNAMIC HT  -         273.25  (meters)     896.5   (feet)  COMP
 EE2309
 EE2309  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 EE2309  Type    PID    Designation                 North   East  Ellip
 EE2309  ----------------------------------------------------------------------
 EE2309  NETWORK EE2309 25 10                       1.10   0.96   2.92
 EE2309  ----------------------------------------------------------------------
 EE2309  MODELED GRAV-     979,590.8   (mgal)                 NAVD 88
 EE2309
 EE2309  VERT ORDER  -  THIRD
 EE2309
 EE2309.The horizontal coordinates were established by GPS observations
 EE2309.and adjusted by the National Geodetic Survey in February 2007.
 EE2309
 EE2309.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 EE2309.See National Readjustment  for more information.
 EE2309
 EE2309.The horizontal coordinates are valid at the epoch date displayed above
 EE2309.which is a decimal equivalence of Year/Month/Day.
 EE2309
 EE2309.The orthometric height was determined by differential leveling
 EE2309.and adjusted in September 1998.
 EE2309
 EE2309.The height was determined by precise leveling from only one NSRS
 EE2309.bench mark.  This was not adequate "tie leveling" to NSRS and was
 EE2309.allowed ONLY to validate the GPS-derived height.
 EE2309
 EE2309.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 EE2309
 EE2309.The Laplace correction was computed from DEFLEC09 derived deflections.
 EE2309
 EE2309.The ellipsoidal height was determined by GPS observations
 EE2309.and is referenced to NAD 83.
 EE2309
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EE2309.The geoid height was determined by GEOID09.
EE2309
EE2309.The dynamic height is computed by dividing the NAVD 88
EE2309.geopotential number by the normal gravity value computed on the
EE2309.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
EE2309.degrees latitude (g = 980.6199 gals.).
EE2309
EE2309.The modeled gravity was interpolated from observed gravity values.
EE2309
EE2309; North East Units Scale Factor Converg.
EE2309;SPC AL E - 429,813.615 205,000.781 MT 0.99996031 +0 01 50.5
EE2309;UTM 16 - 3,804,524.537 612,264.184 MT 0.99975535 +0 41 22.2
EE2309
EE2309! - Elev Factor x Scale Factor = Combined Factor
EE2309!SPC AL E - 0.99996158 x 0.99996031 = 0.99992189
EE2309!UTM 16 - 0.99996158 x 0.99975535 = 0.99971694
EE2309
EE2309: Primary Azimuth Mark Grid Az
EE2309:SPC AL E - 25 9 203 45 43.5
EE2309:UTM 16 - 25 9 203 06 11.8
EE2309
EE2309|----------|
EE2309| PID Reference Object Distance Geod. Az |
EE2309| dddmmss.s |
EE2309| EE2323 25 9 443.284 METERS 2034734.0 |
EE2309|----------|
EE2309
EE2309 SUPERSEDED SURVEY CONTROL
EE2309
EE2309 ELLIP H (07/29/02) 244.712 (m) GP( ) 4 1
EE2309 NAD 83(1992)- 34 22 33.65370(N) 085 46 44.25954(W) AD( ) 1
EE2309 ELLIP H (12/04/92) 244.792 (m) GP( ) 4 1
EE2309 NAD 83(1992)- 34 22 33.66014(N) 085 46 44.25907(W) AD( ) 1
EE2309 NGVD 29 (??/??/??) 273.53 (m) 897.4 (f) N HEIGHT 3
EE2309
EE2309.Superseded values are not recommended for survey control.
EE2309.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
EE2309.See file dsdata.txt to determine how the superseded data were derived.
EE2309
EE2309_U.S. NATIONAL GRID SPATIAL ADDRESS: 16SFD1226404524(NAD 83)
EE2309
EE2309_MARKER: DD = SURVEY DISK
EE2309_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
EE2309_SP_SET: CONCRETE POST
EE2309_STAMPING: 25 - 10 1990
EE2309_MARK LOGO: ALHD
EE2309_MAGNETIC: R = STEEL ROD IMBEDDED IN MONUMENT
EE2309_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
EE2309+STABILITY: SURFACE MOTION
EE2309_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
EE2309+SATELLITE: SATELLITE OBSERVATIONS - November 06, 2009
EE2309

EE2309 HISTORY - Date Condition Report By
EE2309 HISTORY - 1990 MONUMENTED ALHD
EE2309 HISTORY - 20040401 GOOD ALHD
EE2309 HISTORY - 20091106 GOOD TVA
EE2309
EE2309 STATION DESCRIPTION
EE2309
EE2309'DESCRIBED BY ALABAMA HIGHWAY DEPARTMENT 1990
EE2309'THE STATION IS LOCATED IN DEKALB COUNTY ON THE EAST RIGHT OF WAY OF U.
EE2309'S. 11, ABOUT 9.25 KM (5.75 MI) SOUTHWEST OF FORT PAYNE AND ABOUT
EE2309'14.40 KM (8.95 MI) NORTHEAST OF COLLINSVILLE.
EE2309'TO REACH THE STATION FROM THE SOUTH JUNCTION OF U. S. 11, GAULT AVENUE
EE2309'SOUTH, AND ALA 35 NORTH, DRIVE SOUTH ON U. S. 11 7.48 KM (4.65 MI) TO
EE2309'MILE POST 224.10, DEKALB COUNTY ROAD NO. 81 ON THE LEFT, AND THE
EE2309'STATION ON THE RIGHT.
EE2309'THE STATION IS 11.19 M (36.71 FT) WEST - NORTHWEST OF THE CENTERLINE
EE2309'OF U. S. 11, 16.34 M (53.61 FT) SOUTH - SOUTHWEST OF A JUNCTION POWER
EE2309'POLE WITH A TRANSFORMER, 23.47 M (77.00 FT) SOUTH - SOUTHWEST OF THE
EE2309'EAST END OF AN AKINS FURNITURE SIGN, 23.47 M (77.00 FT) WEST -
EE2309'SOUTHWEST OF THE CENTER OF THE INTERSECTION OF U. S. 11 AND DEKALB
EE2309'COUNTY ROAD NO. 81, 24.14 M (79.20 FT) SOUTH - SOUTHWEST OF THE WEST
EE2309'END OF AN AKINS FURNITURE SIGN, 0.88 M (2.89 FT) EAST - SOUTHEAST OF
EE2309'A CARSONITE WITNESS POST, AND SET FLUSH WITH THE GROUND.
EE2309'STATION 25 - 9 1990 MAY BE USED AS AN AZIMUTH FOR THIS STATION.
EE2309
EE2309 STATION RECOVERY (2004)
EE2309
EE2309'RECOVERY NOTE BY ALABAMA HIGHWAY DEPARTMENT 2004 (JDS)
EE2309'RECOVERED IN GOOD CONDITION.
EE2309
EE2309 STATION RECOVERY (2009)
EE2309
EE2309'RECOVERY NOTE BY TENNESSEE VALLEY AUTHORITY 2009 (MWN)
EE2309'RECOVERED, ADDENDUM TO DESCRIPTION, STATION IS LOCATED 2.33 FEET FROM
EE2309'A METAL FENCE POST. STATION IS LOCATED 7.7 FEET WEST FROM A OVERHEAD
EE2309'2.9KV SERVICE LINE, STATION IS ALSO LOCATED N-18-45-45W (MAGNETIC) 17
EE2309'FEET FROM A WATER VALVE.

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AA2951 ********************************************************************
 AA2951  DESIGNATION -  25 23
 AA2951  PID        -  AA2951
 AA2951  STATE/COUNTY-  AL/DE KALB
 AA2951  USGS QUAD   -  CROSSVILLE (1975)
 AA2951
 AA2951                  *CURRENT SURVEY CONTROL
 AA2951  ______________________________________________________________________
 AA2951* NAD 83(2007)-  34 19 53.78840(N)    085 59 55.84299(W)     ADJUSTED
 AA2951* NAVD 88     -      339.5    (meters)    1114.     (feet)  VERTCON
 AA2951  ______________________________________________________________________
 AA2951  EPOCH DATE  -       2002.00
 AA2951  X          -    367,921.954 (meters)                COMP
 AA2951  Y          - -5,260,005.653 (meters)                COMP
 AA2951  Z          -  3,577,057.135 (meters)                COMP
 AA2951  LAPLACE CORR-          0.96  (seconds)              DEFLEC09
 AA2951  ELLIP HEIGHT-        310.593 (meters)         (02/10/07) ADJUSTED
 AA2951  GEOID HEIGHT-        -28.87  (meters)                GEOID09
 AA2951
 AA2951  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 AA2951  Type    PID    Designation                  North   East  Ellip
 AA2951  ----------------------------------------------------------------
 AA2951  NETWORK AA2951 25 23                        1.18   0.84   2.76
 AA2951  ----------------------------------------------------------------
 AA2951
 AA2951.The horizontal coordinates were established by GPS observations
 AA2951.and adjusted by the National Geodetic Survey in February 2007.
 AA2951
 AA2951.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 AA2951.See National Readjustment  for more information.
 AA2951
 AA2951.The horizontal coordinates are valid at the epoch date displayed above
 AA2951.which is a decimal equivalence of Year/Month/Day.
 AA2951
 AA2951.The NAVD 88 height was computed by applying the VERTCON shift value to
 AA2951.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 AA2951
 AA2951.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AA2951
 AA2951.The Laplace correction was computed from DEFLEC09 derived deflections.
 AA2951
 AA2951.The ellipsoidal height was determined by GPS observations
 AA2951.and is referenced to NAD 83.
 AA2951
 AA2951.The geoid height was determined by GEOID09.
 AA2951
 AA2951;               North        East     Units Scale Factor Converg.
 AA2951;SPC AL E     -  424,898.853   184,769.490   MT  0.99996286   -0 05 36.0
 AA2951;UTM  16      - 3,799,378.811   592,095.378   MT  0.99970455   +0 33 52.8
 AA2951
 AA2951!          - Elev Factor  x  Scale Factor =   Combined Factor
 AA2951!SPC AL E     -  0.99995125  x   0.99996286  =   0.99991411
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AA2951!UTM  16     -  0.99995125  x  0.99970455  =  0.99965581
AA2951
AA2951:              Primary Azimuth Mark                Grid Az
AA2951:SPC AL E    -  25 22                          176 28 11.4
AA2951:UTM  16     -  25 22                           175 48 42.6
AA2951
AA2951|-----------------------------------------------------------------------|
AA2951| PID    Reference Object                Distance      Geod. Az  |
AA2951|                                         dddmmss.s |
AA2951| AA2950 25 22                          442.517 METERS 1762235.4 |
AA2951|-----------------------------------------------------------------------|
AA2951
AA2951                     SUPERSEDED SURVEY CONTROL
AA2951
AA2951  ELLIP H (07/29/02)  310.573  (m)                  GP(      ) 4 1
AA2951  NAD 83(1992)-  34 19 53.78838(N)    085 59 55.84347(W) AD(      ) 1
AA2951  ELLIP H (03/30/95)  310.656  (m)                  GP(      ) 4 2
AA2951  NGVD 29 (03/30/95)  339.5    (m)        1114.     (f) GPS OBS
AA2951
AA2951.Superseded values are not recommended for survey control.
AA2951.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AA2951.See file dsdata.txt  to determine how the superseded data were derived.
AA2951
AA2951_U.S. NATIONAL GRID SPATIAL ADDRESS: 16SEC9209599378(NAD 83)
AA2951
AA2951_MARKER: DD = SURVEY DISK
AA2951_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
AA2951_SP_SET: CONCRETE POST
AA2951_STAMPING: 25-23 1993
AA2951_MARK LOGO: ALHD
AA2951_MAGNETIC: R = STEEL ROD IMBEDDED IN MONUMENT
AA2951_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AA2951+STABILITY: SURFACE MOTION
AA2951_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AA2951+SATELLITE: SATELLITE OBSERVATIONS - March 17, 2008
AA2951
AA2951  HISTORY    - Date     Condition       Report By
AA2951  HISTORY    - 1993     MONUMENTED      ALHD
AA2951  HISTORY    - 20080317 GOOD            ALADT
AA2951
AA2951                     STATION DESCRIPTION
AA2951
AA2951'DESCRIBED BY ALABAMA HIGHWAY DEPARTMENT 1993 (JDS)
AA2951'THE STATION IS LOCATED IN DEKALB COUNTY ON THE EAST RIGHT OF WAY OF
AA2951'ALA 227, ABOUT 2.10 MI (3.38 KM) SOUTH OF GERALDINE AND ABOUT 3.05 MI
AA2951'(4.91 KM) NORTH OF CROSSVILLE. TO REACH THE STATION FROM THE JUNCTION
AA2951'OF ALA 75 AND ALA 227 (MILE POST 28.90 ON ALA 227 AND MILE POST 72.00
AA2951'ON ALA 75) IN GERALDINE, DRIVE SOUTH ON ALA 227 FOR 2.20 MI (3.54 KM)
AA2951'TO MILE POST 26.70 AND THE STATION ON THE LEFT. THE STATION IS 2.9 FT
AA2951'(0.9 M) WEST OF A SIX STRAND BARBED WIRE FENCE ON OLD TREATED WOOD
AA2951'POSTS, 41.4 FT (12.6 M) EAST OF THE CENTERLINE OF ALA 227, 76.8 FT
AA2951'(23.4 M) SOUTH OF TRANSFORMER POWER POLE NO. 10, 84.8 FT (25.8 M)
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AA2951'NORTH-NORTHWEST OF A POWER POLE, 3.2 FT (1.0 M) WEST OF A CARSONITE
AA2951'WITNESS POST, AND SET FLUSH WITH THE GROUND. STATION 25-22 1993 MAY BE
AA2951'USED AS AN AZIMUTH FOR THIS STATION.
AA2951
AA2951 STATION RECOVERY (2008)
AA2951
AA2951'RECOVERY NOTE BY ALABAMA DEPT OF TRANSPORTATION 2008 (JDS)
AA2951'RECOVERED IN GOOD CONDITION.

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AA2974 ********************************************************************
 AA2974  DESIGNATION -  25 46
 AA2974  PID        -  AA2974
 AA2974  STATE/COUNTY-  AL/DE KALB
 AA2974  USGS QUAD   -  VALLEY HEAD (1983)
 AA2974
 AA2974                  *CURRENT SURVEY CONTROL
 AA2974  ______________________________________________________________________
 AA2974* NAD 83(2007)-  34 36 59.40011(N)    085 36 42.53090(W)     ADJUSTED
 AA2974* NAVD 88    -      289.9    (meters)     951.     (feet)  VERTCON
 AA2974  ______________________________________________________________________
 AA2974  EPOCH DATE  -       2002.00
 AA2974  X          -    402,072.561 (meters)                COMP
 AA2974  Y          -  -5,239,522.789 (meters)                COMP
 AA2974  Z          -   3,603,083.525 (meters)                COMP
 AA2974  LAPLACE CORR-          0.04  (seconds)              DEFLEC09
 AA2974  ELLIP HEIGHT-        261.095 (meters)         (02/10/07) ADJUSTED
 AA2974  GEOID HEIGHT-        -28.78  (meters)                GEOID09
 AA2974
 AA2974  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 AA2974  Type    PID    Designation                  North   East  Ellip
 AA2974  ----------------------------------------------------------------
 AA2974  NETWORK AA2974 25 46                        1.31   1.14   3.06
 AA2974  ----------------------------------------------------------------
 AA2974
 AA2974.The horizontal coordinates were established by GPS observations
 AA2974.and adjusted by the National Geodetic Survey in February 2007.
 AA2974
 AA2974.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 AA2974.See National Readjustment  for more information.
 AA2974
 AA2974.The horizontal coordinates are valid at the epoch date displayed above
 AA2974.which is a decimal equivalence of Year/Month/Day.
 AA2974
 AA2974.The NAVD 88 height was computed by applying the VERTCON shift value to
 AA2974.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 AA2974
 AA2974.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AA2974
 AA2974.The Laplace correction was computed from DEFLEC09 derived deflections.
 AA2974
 AA2974.The ellipsoidal height was determined by GPS observations
 AA2974.and is referenced to NAD 83.
 AA2974
 AA2974.The geoid height was determined by GEOID09.
 AA2974
 AA2974;               North        East     Units Scale Factor Converg.
 AA2974;SPC AL E    -  456,510.855   220,315.181   MT  0.99996508   +0 07 33.0
 AA2974;UTM  16     - 3,831,391.653   627,266.876   MT  0.99979964   +0 47 19.3
 AA2974
 AA2974!          - Elev Factor  x  Scale Factor =   Combined Factor
 AA2974!SPC AL E    -  0.99995902  x   0.99996508  =   0.99992410
```

AA2974!UTM 16 - 0.99995902 x 0.99979964 = 0.99975866
AA2974
AA2974: Primary Azimuth Mark Grid Az
AA2974:SPC AL E - 25 47 025 55 41.4
AA2974:UTM 16 - 25 47 025 15 55.1
AA2974
AA2974|---|
AA2974| PID Reference Object Distance Geod. Az |
AA2974| dddmmss.s |
AA2974| AA2975 25 47 APPROX. 0.6 KM 0260314.4 |
AA2974|---|
AA2974
AA2974 SUPERSEDED SURVEY CONTROL
AA2974
AA2974 ELLIP H (07/29/02) 261.059 (m) GP( ) 4 1
AA2974 NAD 83(1992)- 34 36 59.39974(N) 085 36 42.53069(W) AD( ) 1
AA2974 ELLIP H (03/30/95) 261.154 (m) GP( ) 4 2
AA2974 NGVD 29 (03/30/95) 289.9 (m) 951. (f) GPS OBS
AA2974
AA2974.Superseded values are not recommended for survey control.
AA2974.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AA2974.See file dsdata.txt to determine how the superseded data were derived.
AA2974
AA2974_U.S. NATIONAL GRID SPATIAL ADDRESS: 16SFD2726631391(NAD 83)
AA2974
AA2974_MARKER: DD = SURVEY DISK
AA2974_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
AA2974_SP_SET: CONCRETE POST
AA2974_STAMPING: 25-46 1993
AA2974_MARK LOGO: ALHD
AA2974_MAGNETIC: R = STEEL ROD IMBEDDED IN MONUMENT
AA2974_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AA2974+STABILITY: SURFACE MOTION
AA2974_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AA2974+SATELLITE: SATELLITE OBSERVATIONS - July 10, 2001
AA2974
AA2974 HISTORY - Date Condition Report By
AA2974 HISTORY - 1993 MONUMENTED ALHD
AA2974 HISTORY - 20010710 GOOD ALHD
AA2974
AA2974 STATION DESCRIPTION
AA2974
AA2974'DESCRIBED BY ALABAMA HIGHWAY DEPARTMENT 1993 (JDS)
AA2974'THE STATION IS LOCATED IN DEKALB COUNTY ON THE WEST RIGHT OF WAY OF
AA2974'U.S. 11, ABOUT 3.00 MI (4.83 KM) NORTH-NORTHWEST OF MENTONE AND ABOUT
AA2974'8.10 MI (13.04 KM) EAST OF HENAGAR. TO REACH THE STATION FROM EXIT 231
AA2974'ON I-59 (MILE POST 11.80 ON ALA 117) NEAR HAMMONDVILLE, DRIVE
AA2974'SOUTHEAST ON ALA 117 FOR 1.25 MI (2.01 KM) TO MILE POST 10.55 AND U.S.
AA2974'11 LEFT AND RIGHT (MILE POST 242.00 ON U.S. 11), TURN LEFT ON U.S. 11
AA2974'AND DRIVE NORTHEAST FOR 2.55 MI (4.10 KM) TO MILE POST 244.55 AND THE
AA2974'STATION ON THE LEFT. THE STATION IS 38.0 FT (11.6 M) WEST-NORTHWEST OF
AA2974'THE CENTERLINE OF U.S. 11, 89.6 FT (27.3 M) WEST OF TELEPHONE CABLE

AA2974'PEDESTAL NO. 1 RE ACROSS THE ROAD, 142.4 FT (43.4 M) SOUTHWEST OF
AA2974'TELEPHONE CABLE PEDESTAL NO. 1 64 LP 4 ACROSS THE ROAD, 154.5 FT (47.1
AA2974'M) SOUTH-SOUTHWEST OF A TRANSFORMER POWER POLE, 1.7 FT (0.5 M)
AA2974'SOUTHEAST OF A CARSONITE WITNESS POST, AND SET FLUSH WITH THE GROUND.
AA2974'STATION 25-47 1993 MAY BE USED AS AN AZIMUTH FOR THIS STATION.
AA2974
AA2974 STATION RECOVERY (2001)
AA2974
AA2974'RECOVERY NOTE BY ALABAMA HIGHWAY DEPARTMENT 2001 (JDS)
AA2974'RECOVERED IN GOOD CONDITION.

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AA2997 ********************************************************************
 AA2997  DESIGNATION -  36 21
 AA2997  PID        -  AA2997
 AA2997  STATE/COUNTY-  AL/JACKSON
 AA2997  USGS QUAD   -  TRENTON (1982)
 AA2997
 AA2997                    *CURRENT SURVEY CONTROL
 AA2997  ______________________________________________________________________
 AA2997* NAD 83(2007)-  34 52 27.57648(N)    085 36 24.91845(W)     ADJUSTED
 AA2997* NAVD 88     -      454.5    (meters)    1491.     (feet)  VERTCON
 AA2997  ______________________________________________________________________
 AA2997  EPOCH DATE  -       2002.00
 AA2997  X          -    401,281.575 (meters)                COMP
 AA2997  Y          - -5,223,368.875 (meters)                COMP
 AA2997  Z          -  3,626,680.747 (meters)                COMP
 AA2997  LAPLACE CORR-         -1.44  (seconds)              DEFLEC09
 AA2997  ELLIP HEIGHT-        425.529 (meters)         (02/10/07) ADJUSTED
 AA2997  GEOID HEIGHT-        -28.91  (meters)                GEOID09
 AA2997
 AA2997  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 AA2997  Type    PID    Designation                 North   East  Ellip
 AA2997  ----------------------------------------------------------------
 AA2997  NETWORK AA2997 36 21                       1.43   1.33   4.10
 AA2997  ----------------------------------------------------------------
 AA2997
 AA2997.The horizontal coordinates were established by GPS observations
 AA2997.and adjusted by the National Geodetic Survey in February 2007.
 AA2997
 AA2997.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 AA2997.See National Readjustment  for more information.
 AA2997
 AA2997.The horizontal coordinates are valid at the epoch date displayed above
 AA2997.which is a decimal equivalence of Year/Month/Day.
 AA2997
 AA2997.The NAVD 88 height was computed by applying the VERTCON shift value to
 AA2997.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 AA2997
 AA2997.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AA2997
 AA2997.The Laplace correction was computed from DEFLEC09 derived deflections.
 AA2997
 AA2997.The ellipsoidal height was determined by GPS observations
 AA2997.and is referenced to NAD 83.
 AA2997
 AA2997.The geoid height was determined by GEOID09.
 AA2997
 AA2997;               North        East     Units Scale Factor Converg.
 AA2997;SPC AL E     -  485,113.037   220,699.437   MT  0.99996528   +0 07 46.0
 AA2997;UTM  16      - 3,859,991.634   627,319.123   MT  0.99979979   +0 47 47.9
 AA2997
 AA2997!           - Elev Factor  x  Scale Factor =   Combined Factor
 AA2997!SPC AL E     -  0.99993321  x   0.99996528  =   0.99989849
```

AA2997!UTM 16 - 0.99993321 x 0.99979979 = 0.99973301
AA2997
AA2997: Primary Azimuth Mark Grid Az
AA2997:SPC AL E - 36 22 005 33 32.4
AA2997:UTM 16 - 36 22 004 53 30.5
AA2997
AA2997|----------|
AA2997| PID Reference Object Distance Geod. Az |
AA2997| dddmmss.s |
AA2997| AA2998 36 22 413.895 METERS 0054118.4 |
AA2997|----------|
AA2997
AA2997 SUPERSEDED SURVEY CONTROL
AA2997
AA2997 ELLIP H (07/29/02) 425.500 (m) GP( ) 4 1
AA2997 NAD 83(1992)- 34 52 27.57644(N) 085 36 24.91787(W) AD( ) 1
AA2997 ELLIP H (03/30/95) 425.611 (m) GP( ) 4 2
AA2997 NGVD 29 (03/30/95) 454.5 (m) 1491. (f) GPS OBS
AA2997
AA2997.Superseded values are not recommended for survey control.
AA2997.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AA2997.See file dsdata.txt to determine how the superseded data were derived.
AA2997
AA2997_U.S. NATIONAL GRID SPATIAL ADDRESS: 16SFD2731959991(NAD 83)
AA2997
AA2997_MARKER: DD = SURVEY DISK
AA2997_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
AA2997_SP_SET: CONCRETE POST
AA2997_STAMPING: 36-21 1993
AA2997_MARK LOGO: ALHD
AA2997_MAGNETIC: R = STEEL ROD IMBEDDED IN MONUMENT
AA2997_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AA2997+STABILITY: SURFACE MOTION
AA2997_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AA2997+SATELLITE: SATELLITE OBSERVATIONS - June 21, 2006
AA2997
AA2997 HISTORY - Date Condition Report By
AA2997 HISTORY - 1993 MONUMENTED ALHD
AA2997 HISTORY - 20060621 GOOD GADT
AA2997
AA2997 STATION DESCRIPTION
AA2997
AA2997'DESCRIBED BY ALABAMA HIGHWAY DEPARTMENT 1993 (JDS)
AA2997'THE STATION IS LOCATED IN JACKSON COUNTY ON THE WEST RIGHT OF WAY OF
AA2997'ALA 73, ABOUT 8.25 MI (13.28 KM) SOUTHEAST OF BRIDGEPORT AND ABOUT
AA2997'13.10 MI (21.08 KM) EAST OF STEVENSON. TO REACH THE STATION FROM THE
AA2997'JUNCTION OF ALA 71 AND ALA 117 (MILE POST 21.35 ON ALA 71 AND MILE
AA2997'POST 25.25 ON ALA 117) AT A FOUR WAY STOP IN FLAT ROCK, DRIVE
AA2997'NORTHEAST ON ALA 71 FOR 8.70 MI (14.00 KM) TO MILE POST 30.05 AND A
AA2997'Y-INTERSECTION WITH ALA 73 ON THE LEFT AND ALA 71 ON THE RIGHT, BEAR
AA2997'LEFT ON ALA 73 AND DRIVE NORTH FOR 1.25 MI (2.01 KM) TO MILE POST 1.25
AA2997'AND THE STATION ON THE LEFT. THE STATION IS 3.0 FT (0.9 M) EAST OF A

AA2997'HOG WIRE FENCE WITH ONE STRAND OF BARBED WIRE ON OLD TREATED WOOD
AA2997'POSTS, 4.9 FT (1.5 M) NORTHEAST OF THE SOUTHEAST CORNER OF THE FENCE,
AA2997'7.0 FT (2.1 M) NORTHWEST OF THE CENTER OF A CONCRETE WATER METER BOX,
AA2997'18.0 FT (5.5 M) NORTH OF THE CENTER OF A GRAVEL DRIVEWAY, 32.3 FT (9.8
AA2997'M) NORTH OF THE CROSS TIE EAST END POST OF A HOG WIRE FENCE ACROSS THE
AA2997'GRAVEL DRIVEWAY, 36.7 FT (11.2 M) WEST OF THE CENTERLINE OF ALA 73,
AA2997'92.4 FT (28.2 M) SOUTH OF TELEPHONE CABLE PEDESTAL NO. 1 39, 92.5 FT
AA2997'(28.2 M) SOUTH OF A TELEPHONE SERVICE POLE, 3.1 FT (0.9 M) EAST OF A
AA2997'CARSONITE WITNESS POST, AND SET FLUSH WITH THE GROUND. STATION 36-22
AA2997'1993 MAY BE USED AS AN AZIMUTH FOR THIS STATION.
AA2997
AA2997 STATION RECOVERY (2006)
AA2997
AA2997'RECOVERY NOTE BY GEORGIA DEPARTMENT OF TRANSPORTATION 2006
AA2997'RECOVERED IN GOOD CONDITION.

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AA3005 **********************************************************************
AA3005  DESIGNATION -  36 29
AA3005  PID        -  AA3005
AA3005  STATE/COUNTY-  AL/JACKSON
AA3005  USGS QUAD   -  SYLVANIA (1983)
AA3005
AA3005                  *CURRENT SURVEY CONTROL
AA3005  ______________________________________________________________________
AA3005* NAD 83(2007)-  34 36 09.05133(N)    085 51 21.13234(W)     ADJUSTED
AA3005* NAVD 88    -      439.1    (meters)    1441.     (feet)  VERTCON
AA3005  ______________________________________________________________________
AA3005  EPOCH DATE  -       2002.00
AA3005  X         -     379,823.380 (meters)                COMP
AA3005  Y         - -5,242,189.442 (meters)                COMP
AA3005  Z         -  3,601,891.325 (meters)                COMP
AA3005  LAPLACE CORR-          0.41  (seconds)              DEFLEC09
AA3005  ELLIP HEIGHT-        410.412 (meters)         (02/10/07) ADJUSTED
AA3005  GEOID HEIGHT-        -28.69  (meters)                GEOID09
AA3005
AA3005  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
AA3005  Type    PID    Designation                 North   East  Ellip
AA3005  ----------------------------------------------------------------
AA3005  NETWORK AA3005 36 29                       1.14   1.00   3.16
AA3005  ----------------------------------------------------------------
AA3005
AA3005.The horizontal coordinates were established by GPS observations
AA3005.and adjusted by the National Geodetic Survey in February 2007.
AA3005
AA3005.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
AA3005.See National Readjustment for more information.
AA3005
AA3005.The horizontal coordinates are valid at the epoch date displayed above
AA3005.which is a decimal equivalence of Year/Month/Day.
AA3005
AA3005.The NAVD 88 height was computed by applying the VERTCON shift value to
AA3005.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
AA3005
AA3005.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AA3005
AA3005.The Laplace correction was computed from DEFLEC09 derived deflections.
AA3005
AA3005.The ellipsoidal height was determined by GPS observations
AA3005.and is referenced to NAD 83.
AA3005
AA3005.The geoid height was determined by GEOID09.
AA3005
AA3005;               North        East     Units Scale Factor Converg.
AA3005;SPC AL E    -  454,937.349   197,932.844   MT  0.99996005   -0 00 46.1
AA3005;UTM  16     - 3,829,559.724   604,908.595   MT  0.99973565   +0 38 59.2
AA3005
AA3005!          - Elev Factor  x  Scale Factor =   Combined Factor
AA3005!SPC AL E    -  0.99993558  x   0.99996005  =   0.99989563
```

AA3005!UTM 16 - 0.99993558 x 0.99973565 = 0.99967125
AA3005
AA3005 SUPERSEDED SURVEY CONTROL
AA3005
AA3005 ELLIP H (07/29/02) 410.382 (m) GP( ) 4 1
AA3005 NAD 83(1992)- 34 36 09.05102(N) 085 51 21.13170(W) AD( ) 1
AA3005 ELLIP H (03/30/95) 410.486 (m) GP( ) 4 2
AA3005 NGVD 29 (03/30/95) 439.1 (m) 1441. (f) GPS OBS
AA3005
AA3005.Superseded values are not recommended for survey control.
AA3005.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AA3005.See file dsdata.txt to determine how the superseded data were derived.
AA3005
AA3005_U.S. NATIONAL GRID SPATIAL ADDRESS: 16SFD0490829559(NAD 83)
AA3005
AA3005_MARKER: DD = SURVEY DISK
AA3005_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
AA3005_SP_SET: CONCRETE POST
AA3005_STAMPING: 36-29 1993
AA3005_MARK LOGO: ALHD
AA3005_MAGNETIC: R = STEEL ROD IMBEDDED IN MONUMENT
AA3005_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AA3005+STABILITY: SURFACE MOTION
AA3005_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AA3005+SATELLITE: SATELLITE OBSERVATIONS - 1993
AA3005
AA3005 HISTORY - Date Condition Report By
AA3005 HISTORY - 1993 MONUMENTED ALHD
AA3005
AA3005 STATION DESCRIPTION
AA3005
AA3005'DESCRIBED BY ALABAMA HIGHWAY DEPARTMENT 1993 (JDS)
AA3005'THE STATION IS LOCATED IN JACKSON COUNTY ON THE NORTH RIGHT OF WAY OF
AA3005'JACKSON COUNTY ROAD NO. 16, ABOUT 3.60 MI (5.79 KM) EAST OF DUTTON AND
AA3005'ABOUT 5.40 MI (8.69 KM) SOUTH OF PISGAH. TO REACH THE STATION FROM THE
AA3005'JUNCTION OF ALA 35 AND ALA 71 (MILE POST 0.00 0N ALA 71 AND MILE POST
AA3005'42.45 ON ALA 35) IN SECTION, DRIVE NORTHEAST ON ALA 71 FOR 5.00 MI
AA3005'(8.05 KM) TO MILE POST 5.00 AND JACKSON COUNTY ROAD NO. 16 ON THE
AA3005'RIGHT AT A HIGH VOLTAGE POWER LINE CROSSING AND A WATER TANK, TURN
AA3005'RIGHT ON JACKSON COUNTY ROAD NO. 16 AND DRIVE SOUTHEAST AND EAST FOR
AA3005'3.45 MI (5.55 KM) TO THE STATION ON THE LEFT. THE STATION IS LOCATED
AA3005'ACROSS JACKSON COUNTY ROAD NO. 16 FROM JACKSON COUNTY ROAD NO. 123
AA3005'SOUTH, 2.8 FT (0.9 M) SOUTH OF A FIVE STRAND BARBED WIRE FENCE ON
AA3005'RUSTY STEEL POSTS, 28.4 FT (8.7 M) WEST-SOUTHWEST OF A CABLE GUY POLE,
AA3005'40.8 FT (12.4 M) NORTH OF THE CENTERLINE OF JACKSON COUNTY ROAD NO.
AA3005'16, 51.8 FT (15.8 M) WEST OF THE SOUTHEAST CORNER OF THE FENCE, 62.4
AA3005'FT (19.0 M) EAST-SOUTHEAST OF A JUNCTION POWER POLE, 64.2 FT (19.6 M)
AA3005'EAST-SOUTHEAST OF A CABLE POLE, 69.8 FT (21.3 M) EAST-SOUTHEAST OF
AA3005'TELEPHONE CABLE PEDESTAL NO. 2 62, 87.5 FT (26.7 M) NORTHWEST OF CABLE
AA3005'POLE NO. 2 143 ACROSS THE ROAD, 3.0 FT (0.9 M) SOUTH OF THE CARSONITE
AA3005'WITNESS POST, AND SET FLUSH WITH THE GROUND. STATION 36-28 1993 MAY BE
AA3005'USED AS AN AZIMUTH FOR THIS STATION.

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**********************************************************************
 AA3012  DESIGNATION -  36 36
 AA3012  PID        -  AA3012
 AA3012  STATE/COUNTY-  AL/JACKSON
 AA3012  COUNTRY    -  US
 AA3012  USGS QUAD  -  DORAN COVE (1988)
 AA3012
 AA3012                  *CURRENT SURVEY CONTROL
 AA3012 ______________________________________________________________________
 AA3012* NAD 83(2007) POSITION- 34 53 03.03802(N) 085 51 33.73189(W)   ADJUSTED
 AA3012* NAD 83(2007) ELLIP HT-   155.798 (meters)       (02/10/07)   ADJUSTED
 AA3012* NAD 83(2007) EPOCH   -  2002.00
 AA3012* NAVD 88 ORTHO HEIGHT -   184.671  (meters)     605.87  (feet) ADJUSTED
 AA3012 ______________________________________________________________________
 AA3012  NAD 83(2007) X -    378,202.220 (meters)                 COMP
 AA3012  NAD 83(2007) Y - -5,224,242.228 (meters)                 COMP
 AA3012  NAD 83(2007) Z -  3,627,423.023 (meters)                 COMP
 AA3012  LAPLACE CORR   -        -1.05  (seconds)               DEFLEC09
 AA3012  GEOID HEIGHT   -       -28.87  (meters)                GEOID09
 AA3012  DYNAMIC HEIGHT -       184.491 (meters)     605.28  (feet) COMP
 AA3012  MODELED GRAVITY -    979,655.7   (mgal)                  NAVD 88
 AA3012
 AA3012  VERT ORDER     -  SECOND    CLASS I
 AA3012
 AA3012  FGDC Geospatial Positioning Accuracy Standards (95% confidence, cm)
 AA3012  Type                           Horiz  Ellip  Dist(km)
 AA3012  ----------------------------------------------------------------
 AA3012  NETWORK                          1.22   2.69
 AA3012  ----------------------------------------------------------------
 AA3012  MEDIAN LOCAL ACCURACY AND DIST (005 points)   1.16   2.72     9.76
 AA3012  ----------------------------------------------------------------
 AA3012  NOTE: Click here for information on individual local accuracy
 AA3012  values and other accuracy information.
 AA3012
 AA3012
 AA3012.The horizontal coordinates were established by GPS observations
 AA3012.and adjusted by the National Geodetic Survey in February 2007.
 AA3012
 AA3012.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 AA3012.See www.ngs.noaa.gov/web/surveys/NSRS2007 for more information.
 AA3012
 AA3012.The horizontal coordinates are valid at the epoch date displayed above
 AA3012.which is a decimal equivalence of Year/Month/Day.
 AA3012
 AA3012.The orthometric height was determined by differential leveling and
 AA3012.adjusted in July 2011.
 AA3012
 AA3012.No vertical observational check was made to the station.
 AA3012
 AA3012.The X, Y, and Z were computed from the position and the ellipsoidal ht.
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AA3012
AA3012.The Laplace correction was computed from DEFLEC09 derived deflections.
AA3012
AA3012.The ellipsoidal height was determined by GPS observations
AA3012.and is referenced to NAD 83.
AA3012
AA3012.The dynamic height is computed by dividing the NAVD 88
AA3012.geopotential number by the normal gravity value computed on the
AA3012.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
AA3012.degrees latitude (g = 980.6199 gals.).
AA3012
AA3012.The modeled gravity was interpolated from observed gravity values.
AA3012
AA3012. The following values were computed from the NAD 83(2007) position.
AA3012
AA3012; North East Units Scale Factor Converg.
AA3012;SPC AL E - 486,182.708 197,619.914 MT 0.99996007 -0 00 53.6
AA3012;UTM 16 - 3,860,792.309 604,233.230 MT 0.99973390 +0 39 08.7
AA3012
AA3012! - Elev Factor x Scale Factor = Combined Factor
AA3012!SPC AL E - 0.99997555 x 0.99996007 = 0.99993562
AA3012!UTM 16 - 0.99997555 x 0.99973390 = 0.99970945
AA3012
AA3012: Primary Azimuth Mark Grid Az
AA3012:SPC AL E - 36 37 003 59 12.3
AA3012:UTM 16 - 36 37 003 19 10.0
AA3012
AA3012|----------|
AA3012| PID Reference Object Distance Geod. Az |
AA3012| dddmmss.s |
AA3012| AA3013 36 37 430.935 METERS 0035818.7 |
AA3012|----------|
AA3012
AA3012 SUPERSEDED SURVEY CONTROL
AA3012
AA3012 ELLIP H (07/29/02) 155.781 (m) GP( ) 4 1
AA3012 NAD 83(1992)- 34 53 03.03775(N) 085 51 33.73146(W) AD( ) 1
AA3012 ELLIP H (03/30/95) 155.847 (m) GP( ) 4 2
AA3012 NGVD 29 (03/30/95) 184.7 (m) GEOID93 model used GPS OBS
AA3012
AA3012.Superseded values are not recommended for survey control.
AA3012.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AA3012.See file dsdata.txt to determine how the superseded data were derived.
AA3012
AA3012_U.S. NATIONAL GRID SPATIAL ADDRESS: 16SFD0423360792(NAD 83)
AA3012
AA3012_MARKER: DD = SURVEY DISK
AA3012_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
AA3012_SP_SET: CONCRETE POST
AA3012_STAMPING: 36-36 1993
AA3012_MARK LOGO: ALHD
AA3012_PROJECTION: FLUSH

AA3012_MAGNETIC: R = STEEL ROD IMBEDDED IN MONUMENT
AA3012_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AA3012+STABILITY: SURFACE MOTION
AA3012_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AA3012+SATELLITE: SATELLITE OBSERVATIONS - August 10, 2010
AA3012
AA3012 HISTORY - Date Condition Report By
AA3012 HISTORY - 1993 MONUMENTED ALHD
AA3012 HISTORY - 20100810 GOOD HATMOT
AA3012
AA3012 STATION DESCRIPTION
AA3012
AA3012'DESCRIBED BY ALABAMA HIGHWAY DEPARTMENT 1993 (JDS)
AA3012'THE STATION IS LOCATED IN JACKSON COUNTY ON THE WEST RIGHT OF WAY OF
AA3012'ALA 117 IN STEVENSON. TO REACH THE STATION FROM THE JUNCTION OF U.S.
AA3012'72 AND ALA 117 (MILE POST 37.10 ON ALA 117 AND MILE POST 156.75 ON
AA3012'U.S. 72) AT AN INTERCHANGE IN STEVENSON, DRIVE NORTHWEST ON ALA 117
AA3012'FOR 3.40 MI (5.47 KM) TO MILE POST 40.50 AND THE STATION ON THE LEFT.
AA3012'THE STATION IS 32.2 FT (9.8 M) WEST OF THE CENTERLINE OF ALA 117,
AA3012'104.4 FT (31.8 M) SOUTHWEST OF THE SOUTH CROSS TIE POST OF A RUSTY HOG
AA3012'WIRE AND PIPE GATE ACROSS THE ROAD, 113.9 FT (34.7 M) SOUTHWEST OF THE
AA3012'NORTH EIGHT-INCH POST OF A RUSTY HOG WIRE AND PIPE GATE ACROSS THE
AA3012'ROAD, 168.8 FT (51.5 M) NORTH OF TELEPHONE CABLE PEDESTAL NO. P 28,
AA3012'169.0 FT (51.5 M) NORTH OF A TELEPHONE SERVICE AND POWER LINE GUY
AA3012'POLE, 1.6 FT (0.5 M) EAST OF A CARSONITE WITNESS POST, AND SET FLUSH
AA3012'WITH THE GROUND. STATION 36-37 1993 MAY BE USED AS AN AZIMUTH FOR THIS
AA3012'STATION.
AA3012
AA3012 STATION RECOVERY (2010)
AA3012
AA3012'RECOVERY NOTE BY HATCH MOTT MACDONALD 2010 (TLA)
AA3012'RECOVERED IN GOOD CONDITION. NOTE FOLLOWING REVISIONS.
AA3012'
AA3012'MARK IS 119 FT (36.3 M) SOUTHWEST OF AND ACROSS THE ROAD FROM A FENCE
AA3012'CORNER POST ON THE NORTH SIDE OF A GRAVEL DRIVE AND 1.6 FT (0.5 M)
AA3012'EAST OF A METAL WITNESS POST

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 AA3022  DESIGNATION -  36 47
 AA3022  PID        -  AA3022
 AA3022  STATE/COUNTY-  AL/JACKSON
 AA3022  USGS QUAD   -  MUD CREEK (1982)
 AA3022
 AA3022                   *CURRENT SURVEY CONTROL
 AA3022  ______________________________________________________________
 AA3022* NAD 83(2007)-  34 51 33.26001(N)    086 06 05.08342(W)     ADJUSTED
 AA3022* NAVD 88     -      518.6    (meters)    1701.     (feet)  VERTCON
 AA3022  ______________________________________________________________
 AA3022  EPOCH DATE  -       2002.00
 AA3022  X          -     356,255.643 (meters)                COMP
 AA3022  Y          -  -5,227,644.924 (meters)                COMP
 AA3022  Z          -   3,625,344.064 (meters)                COMP
 AA3022  LAPLACE CORR-         -0.20  (seconds)              DEFLEC09
 AA3022  ELLIP HEIGHT-        489.834 (meters)          (02/10/07) ADJUSTED
 AA3022  GEOID HEIGHT-        -28.59  (meters)              GEOID09
 AA3022
 AA3022  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 AA3022  Type    PID    Designation                North   East  Ellip
 AA3022  ----------------------------------------------------------------
 AA3022  NETWORK AA3022 36 47                      1.08   0.90   3.27
 AA3022  ----------------------------------------------------------------
 AA3022
 AA3022.The horizontal coordinates were established by GPS observations
 AA3022.and adjusted by the National Geodetic Survey in February 2007.
 AA3022
 AA3022.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 AA3022.See National Readjustment for more information.
 AA3022
 AA3022.The horizontal coordinates are valid at the epoch date displayed above
 AA3022.which is a decimal equivalence of Year/Month/Day.
 AA3022
 AA3022.The NAVD 88 height was computed by applying the VERTCON shift value to
 AA3022.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 AA3022
 AA3022.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AA3022
 AA3022.The Laplace correction was computed from DEFLEC09 derived deflections.
 AA3022
 AA3022.The ellipsoidal height was determined by GPS observations
 AA3022.and is referenced to NAD 83.
 AA3022
 AA3022.The geoid height was determined by GEOID09.
 AA3022
 AA3022;              North        East     Units Scale Factor Converg.
 AA3022;SPC AL E    -  483,448.672   175,486.698   MT  0.99996740   -0 09 11.6
 AA3022;UTM  16     - 3,857,801.538   582,138.985   MT  0.99968315   +0 30 49.1
 AA3022
 AA3022!          - Elev Factor  x  Scale Factor =   Combined Factor
 AA3022!SPC AL E    -  0.99992312  x   0.99996740  =   0.99989052
```

AA3022!UTM 16 - 0.99992312 x 0.99968315 = 0.99960629
AA3022
AA3022: Primary Azimuth Mark Grid Az
AA3022:SPC AL E - 36 46 193 24 21.4
AA3022:UTM 16 - 36 46 192 44 20.7
AA3022
AA3022|---|
AA3022| PID Reference Object Distance Geod. Az |
AA3022| dddmmss.s |
AA3022| AA3021 36 46 402.502 METERS 1931509.8 |
AA3022|---|
AA3022
AA3022 SUPERSEDED SURVEY CONTROL
AA3022
AA3022 ELLIP H (07/29/02) 489.823 (m) GP( ) 4 1
AA3022 NAD 83(1992)- 34 51 33.26017(N) 086 06 05.08311(W) AD( ) 1
AA3022 ELLIP H (03/30/95) 489.889 (m) GP( ) 4 2
AA3022 NGVD 29 (03/30/95) 518.5 (m) 1701. (f) GPS OBS
AA3022
AA3022.Superseded values are not recommended for survey control.
AA3022.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AA3022.See file dsdata.txt to determine how the superseded data were derived.
AA3022
AA3022_U.S. NATIONAL GRID SPATIAL ADDRESS: 16SED8213857801(NAD 83)
AA3022
AA3022_MARKER: DD = SURVEY DISK
AA3022_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
AA3022_SP_SET: CONCRETE POST
AA3022_STAMPING: 36-47 1993
AA3022_MARK LOGO: ALHD
AA3022_MAGNETIC: R = STEEL ROD IMBEDDED IN MONUMENT
AA3022_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AA3022+STABILITY: SURFACE MOTION
AA3022_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AA3022+SATELLITE: SATELLITE OBSERVATIONS - 1993
AA3022
AA3022 HISTORY - Date Condition Report By
AA3022 HISTORY - 1993 MONUMENTED ALHD
AA3022
AA3022 STATION DESCRIPTION
AA3022
AA3022'DESCRIBED BY ALABAMA HIGHWAY DEPARTMENT 1993 (JDS)
AA3022'THE STATION IS LOCATED IN JACKSON COUNTY ON THE EAST RIGHT OF WAY OF
AA3022'ALA 79, ABOUT 3.50 MI (5.63 KM) NORTH-NORTHEAST OF SKYLINE AND ABOUT
AA3022'11.85 MI (19.07 KM) NORTHWEST OF HOLLYWOOD. TO REACH THE STATION FROM
AA3022'THE JUNCTION OF U.S. 72 AND ALA 79 (MILE POST 92.25 ON ALA 79 AND MILE
AA3022'POST 133.40 ON U.S. 72) ON THE WEST SIDE OF SCOTTSBORO, DRIVE NORTH ON
AA3022'ALA 79 FOR 4.95 MI (7.97 KM) TO MILE POST 97.20 AND ALA 35 LEFT AND
AA3022'RIGHT, CONTINUE NORTH ON ALA 79 FOR 12.15 MI (19.55 KM) TO MILE POST
AA3022'109.35 AND ALA 146 ON THE LEFT, CONTINUE NORTH ON ALA 79 FOR 0.55 MI
AA3022'(0.89 KM) TO MILE POST 109.90 AND THE STATION ON THE RIGHT. THE
AA3022'STATION IS 2.9 FT (0.9 M) WEST OF A FIVE STRAND BARBED WIRE FENCE ON

AA3022'OLD WOOD POSTS, 34.0 FT (10.4 M) SOUTH OF AN UNUSED GRAVEL FIELD ROAD,
AA3022'38.0 FT (11.6 M) SOUTHEAST OF THE SOUTH END OF A FIFTEEN-INCH
AA3022'CORREGATED METAL PIPE UNDER A GRAVEL FIELD ROAD, 50.0 FT (15.2 M)
AA3022'SOUTH OF A FENCE JUNCTION, 54.0 FT (16.5 M) EAST OF THE CENTERLINE OF
AA3022'ALA 79, 129.0 FT (39.3 M) NORTHEAST OF THE NORTHEAST CORNER OF A
AA3022'GREENHOUSE ACROSS THE ROAD, 3.0 FT (0.9 M) WEST OF A CARSONITE WITNESS
AA3022'POST, AND SET FLUSH WITH THE GROUND. STATION 36-46 1993 MAY BE USED AS
AA3022'AN AZIMUTH FOR THIS STATION.

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**********************************************************************
 AA3023  DESIGNATION -  36 48
 AA3023  PID        -  AA3023
 AA3023  STATE/COUNTY-  AL/JACKSON
 AA3023  USGS QUAD   -  MUD CREEK (1982)
 AA3023
 AA3023                  *CURRENT SURVEY CONTROL
 AA3023  ______________________________________________________________
 AA3023* NAD 83(2007)-  34 46 41.34689(N)    086 07 03.12102(W)     ADJUSTED
 AA3023* NAVD 88    -      477.9    (meters)    1568.    (feet)  VERTCON
 AA3023  ______________________________________________________________
 AA3023  EPOCH DATE  -       2002.00
 AA3023  X          -     355,130.246 (meters)                COMP
 AA3023  Y          - -5,232,836.506 (meters)                COMP
 AA3023  Z          -  3,617,935.246 (meters)                COMP
 AA3023  LAPLACE CORR-         -1.22  (seconds)              DEFLEC09
 AA3023  ELLIP HEIGHT-        449.123 (meters)         (02/10/07) ADJUSTED
 AA3023  GEOID HEIGHT-        -28.67  (meters)                GEOID09
 AA3023
 AA3023  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 AA3023  Type    PID    Designation                 North   East  Ellip
 AA3023  ----------------------------------------------------------------
 AA3023  NETWORK AA3023 36 48                       0.94   0.78   2.41
 AA3023  ----------------------------------------------------------------
 AA3023
 AA3023.The horizontal coordinates were established by GPS observations
 AA3023.and adjusted by the National Geodetic Survey in February 2007.
 AA3023
 AA3023.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 AA3023.See National Readjustment for more information.
 AA3023
 AA3023.The horizontal coordinates are valid at the epoch date displayed above
 AA3023.which is a decimal equivalence of Year/Month/Day.
 AA3023
 AA3023.The NAVD 88 height was computed by applying the VERTCON shift value to
 AA3023.the NGVD 29 height (displayed under SUPERSEDED SURVEY CONTROL.)
 AA3023
 AA3023.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AA3023
 AA3023.The Laplace correction was computed from DEFLEC09 derived deflections.
 AA3023
 AA3023.The ellipsoidal height was determined by GPS observations
 AA3023.and is referenced to NAD 83.
 AA3023
 AA3023.The geoid height was determined by GEOID09.
 AA3023
 AA3023;               North        East     Units Scale Factor Converg.
 AA3023;SPC AL E    -  474,457.487   173,987.052   MT  0.99996834   -0 09 43.6
 AA3023;UTM  16     - 3,848,796.103   580,744.377   MT  0.99968035   +0 30 12.2
 AA3023
 AA3023!          - Elev Factor  x  Scale Factor =   Combined Factor
 AA3023!SPC AL E    -  0.99992951  x   0.99996834  =   0.99989785
```

```
AA3023!UTM  16     -  0.99992951  x  0.99968035  =  0.99960988
AA3023
AA3023|--------------------------------------------------------------------|
AA3023| PID    Reference Object                Distance      Geod. Az  |
AA3023|                                          dddmmss.s |
AA3023| AA3024 36 49                          394.560 METERS 35247     |
AA3023|--------------------------------------------------------------------|
AA3023
AA3023                    SUPERSEDED SURVEY CONTROL
AA3023
AA3023  ELLIP H (07/29/02)  449.105  (m)                   GP(      ) 4 1
AA3023  NAD 83(1992)-  34 46 41.34695(N)    086 07 03.12062(W) AD(      ) 1
AA3023  ELLIP H (03/30/95)  449.184  (m)                   GP(      ) 4 2
AA3023  NGVD 29 (03/30/95)  477.9    (m)        1568.     (f) GPS OBS
AA3023
AA3023.Superseded values are not recommended for survey control.
AA3023.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AA3023.See file dsdata.txt to determine how the superseded data were derived.
AA3023
AA3023_U.S. NATIONAL GRID SPATIAL ADDRESS: 16SED8074448796(NAD 83)
AA3023
AA3023_MARKER: DD = SURVEY DISK
AA3023_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
AA3023_SP_SET: CONCRETE POST
AA3023_STAMPING: 36-48 1993
AA3023_MARK LOGO: ALHD
AA3023_MAGNETIC: R = STEEL ROD IMBEDDED IN MONUMENT
AA3023_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AA3023+STABILITY: SURFACE MOTION
AA3023_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AA3023+SATELLITE: SATELLITE OBSERVATIONS - 1993
AA3023
AA3023  HISTORY    - Date     Condition       Report By
AA3023  HISTORY    - 1993     MONUMENTED      ALHD
AA3023
AA3023                     STATION DESCRIPTION
AA3023
AA3023'DESCRIBED BY ALABAMA HIGHWAY DEPARTMENT 1993 (JDS)
AA3023'THE STATION IS LOCATED IN JACKSON COUNTY ON THE EAST RIGHT OF WAY OF
AA3023'ALA 79 IN SKYLINE. TO REACH THE STATION FROM THE JUNCTION OF U.S. 72
AA3023'AND ALA 79 (MILE POST 92.25 ON ALA 79 AND MILE POST 133.40 ON U.S. 72)
AA3023'ON THE WEST SIDE OF SCOTTSBORO, DRIVE NORTH ON ALA 79 FOR 4.95 MI
AA3023'(7.97 KM) TO MILE POST 97.20 AND ALA 35 LEFT AND RIGHT, CONTINUE NORTH
AA3023'ON ALA 79 FOR 6.90 MI (11.10 KM) TO MILE POST 104.10 AND THE STATION
AA3023'ON THE RIGHT. THE STATION IS 39.2 FT (11.9 M) NORTHEAST OF A SPEED
AA3023'LIMIT 55 SIGN, 53.0 FT (16.2 M) EAST OF THE CENTERLINE OF ALA 79, 56.7
AA3023'FT (17.3 M) NORTH-NORTHWEST OF A CABLE POLE, 1.8 FT (0.5 M) WEST OF A
AA3023'CARSONITE WITNESS POST, AND SET FLUSH WITH THE GROUND. STATION 36-49
AA3023'1993 MAY BE USED AS AN AZIMUTH FOR THIS STATION.
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 AA3039  FBN       - This is a Federal Base Network Control Station.
 AA3039  DESIGNATION -  36 64
 AA3039  PID       - AA3039
 AA3039  STATE/COUNTY-  AL/JACKSON
 AA3039  COUNTRY    - US
 AA3039  USGS QUAD  -  GRANT (1982)
 AA3039
 AA3039                  *CURRENT SURVEY CONTROL
 AA3039 ______________________________________________________________________
 AA3039* NAD 83(2007) POSITION- 34 36 24.71947(N) 086 15 10.47843(W)   ADJUSTED
 AA3039* NAD 83(2007) ELLIP HT-   157.299 (meters)       (02/10/07)   ADJUSTED
 AA3039* NAD 83(2007) EPOCH   -  2002.00
 AA3039* NAVD 88 ORTHO HEIGHT -   186.223  (meters)    610.97  (feet) ADJUSTED
 AA3039 ______________________________________________________________________
 AA3039  NAD 83(2007) X -    343,456.397 (meters)                COMP
 AA3039  NAD 83(2007) Y  - -5,244,214.096 (meters)                COMP
 AA3039  NAD 83(2007) Z  -  3,602,144.994 (meters)                COMP
 AA3039  LAPLACE CORR   -        0.44  (seconds)              DEFLEC09
 AA3039  GEOID HEIGHT   -      -28.93  (meters)               GEOID09
 AA3039  DYNAMIC HEIGHT -       186.035 (meters)    610.35  (feet) COMP
 AA3039  MODELED GRAVITY -    979,621.2   (mgal)                NAVD 88
 AA3039
 AA3039  VERT ORDER     - SECOND    CLASS I
 AA3039
 AA3039  FGDC Geospatial Positioning Accuracy Standards (95% confidence, cm)
 AA3039  Type                           Horiz  Ellip  Dist(km)
 AA3039  ----------------------------------------------------------------
 AA3039  NETWORK                          0.99   2.27
 AA3039  ----------------------------------------------------------------
 AA3039  MEDIAN LOCAL ACCURACY AND DIST (124 points)   1.24   2.86    224.90
 AA3039  ----------------------------------------------------------------
 AA3039  NOTE: Click here for information on individual local accuracy
 AA3039  values and other accuracy information.
 AA3039
 AA3039
 AA3039.The horizontal coordinates were established by GPS observations
 AA3039.and adjusted by the National Geodetic Survey in February 2007.
 AA3039
 AA3039.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 AA3039.See www.ngs.noaa.gov/web/surveys/NSRS2007 for more information.
 AA3039
 AA3039.The horizontal coordinates are valid at the epoch date displayed above
 AA3039.which is a decimal equivalence of Year/Month/Day.
 AA3039
 AA3039.The orthometric height was determined by differential leveling and
 AA3039.adjusted in September 2008.
 AA3039
 AA3039.No vertical observational check was made to the station.
 AA3039
 AA3039.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AA3039
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AA3039.The Laplace correction was computed from DEFLEC09 derived deflections.
AA3039
AA3039.The ellipsoidal height was determined by GPS observations
AA3039.and is referenced to NAD 83.
AA3039
AA3039.The dynamic height is computed by dividing the NAVD 88
AA3039.geopotential number by the normal gravity value computed on the
AA3039.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
AA3039.degrees latitude (g = 980.6199 gals.).
AA3039
AA3039.The modeled gravity was interpolated from observed gravity values.
AA3039
AA3039. The following values were computed from the NAD 83(2007) position.
AA3039
AA3039; North East Units Scale Factor Converg.
AA3039;SPC AL E - 455,499.937 161,516.680 MT 0.99997825 -0 14 17.9
AA3039;UTM 16 - 3,829,701.109 568,498.281 MT 0.99965783 +0 25 27.6
AA3039
AA3039! - Elev Factor x Scale Factor = Combined Factor
AA3039!SPC AL E - 0.99997531 x 0.99997825 = 0.99995356
AA3039!UTM 16 - 0.99997531 x 0.99965783 = 0.99963315
AA3039
AA3039 SUPERSEDED SURVEY CONTROL
AA3039
AA3039 NAD 83(1992)- 34 36 24.71970(N) 086 15 10.47849(W) AD( ) A
AA3039 ELLIP H (08/29/05) 157.330 (m) GP( ) 4 1
AA3039 ELLIP H (07/29/02) 157.269 (m) GP( ) 4 1
AA3039 NAD 83(1992)- 34 36 24.71954(N) 086 15 10.47852(W) AD( ) 1
AA3039 ELLIP H (03/30/95) 157.361 (m) GP( ) 4 2
AA3039 NAVD 88 (08/29/05) 186.3 (m) GEOID03 model used GPS OBS
AA3039 NGVD 29 (03/30/95) 186.2 (m) GEOID93 model used GPS OBS
AA3039
AA3039.Superseded values are not recommended for survey control.
AA3039.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AA3039.See file dsdata.txt to determine how the superseded data were derived.
AA3039
AA3039_U.S. NATIONAL GRID SPATIAL ADDRESS: 16SED6849829701(NAD 83)
AA3039
AA3039_MARKER: DD = SURVEY DISK
AA3039_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
AA3039_SP_SET: CONCRETE POST
AA3039_STAMPING: 36-64 1993
AA3039_MARK LOGO: ALHD
AA3039_PROJECTION: FLUSH
AA3039_MAGNETIC: R = STEEL ROD IMBEDDED IN MONUMENT
AA3039_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AA3039+STABILITY: SURFACE MOTION
AA3039_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AA3039+SATELLITE: SATELLITE OBSERVATIONS - October 03, 2007
AA3039
AA3039 HISTORY - Date Condition Report By
AA3039 HISTORY - 1993 MONUMENTED ALHD

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AA3039  HISTORY    - 20040401 GOOD         ALHD
AA3039  HISTORY    - 20040624 GOOD         ALPCO
AA3039  HISTORY    - 20071003 GOOD         MAPTEC
AA3039
AA3039                  STATION DESCRIPTION
AA3039
AA3039'DESCRIBED BY ALABAMA HIGHWAY DEPARTMENT 1993 (JDS)
AA3039'THE STATION IS LOCATED IN JACKSON COUNTY ON THE SOUTH RIGHT OF WAY OF
AA3039'U.S. 72, ABOUT 1.70 MI (2.74 KM) SOUTHEAST OF WOODVILLE AND ABOUT
AA3039'13.30 MI (21.40 KM) SOUTHWEST OF SCOTTSBORO. TO REACH THE STATION FROM
AA3039'THE JUNCTION OF U.S. 72 AND ALA 79 (MILE POST 133.40 ON U.S. 72 AND
AA3039'MILE POST 92.25 ON ALA 79) ON THE WEST SIDE OF SCOTTSBORO, DRIVE WEST
AA3039'ON U.S. 72 FOR 9.35 MI (15.05 KM) TO MILE POST 124.05 AND THE STATION
AA3039'ON THE LEFT. THE STATION IS 4.8 FT (1.5 M) NORTH-NORTHWEST OF A HOG
AA3039'WIRE FENCE WITH ONE STRAND OF BARBED WIRE ON FOUR BY FOUR-INCH WOOD
AA3039'POSTS, 57.4 FT (17.5 M) EAST-NORTHEAST OF THE EAST ONE OF THREE
AA3039'CONNECTED POSTS IN THE FENCE LINE, 106.7 FT (32.5 M) SOUTH-SOUTHEAST
AA3039'OF THE CENTERLINE OF THE EAST BOUND LANES OF U.S. 72, 134.8 FT (41.1
AA3039'M) EAST-NORTHEAST OF A TELEPHONE SERVICE POLE, 166.9 FT (50.9 M)
AA3039'WEST-SOUTHWEST OF THE NORTHEAST CORNER OF THE FENCE, 179.0 FT (54.6 M)
AA3039'WEST-SOUTHWEST OF THE CENTER OF A GRAVEL DRIVEWAY, 219.8 FT (67.0 M)
AA3039'EAST OF MILE POST 124 ON THE SOUTH SIDE OF U. S. 72, 251.5 FT (76.7 M)
AA3039'EAST-NORTHEAST OF A TRANSFORMER POWER POLE WITH AN ELECTRIC METER,
AA3039'254.0 FT (77.4 M) EAST-NORTHEAST OF THE CENTER OF A GRAVEL DRIVEWAY,
AA3039'4.6 FT (1.4 M) NORTHWEST OF A CARSONITE WITNESS POST, AND SET FLUSH
AA3039'WITH THE GROUND. STATION 36-65 1993 MAY BE USED AS AN AZIMUTH FOR THIS
AA3039'STATION.
AA3039
AA3039                  STATION RECOVERY (2004)
AA3039
AA3039'RECOVERY NOTE BY ALABAMA HIGHWAY DEPARTMENT 2004 (JDS)
AA3039'RECOVERED IN GOOD CONDITION.
AA3039
AA3039                  STATION RECOVERY (2004)
AA3039
AA3039'RECOVERY NOTE BY ALABAMA POWER COMPANY 2004 (KSB)
AA3039'RECOVERED AS DESCRIBED.
AA3039
AA3039                  STATION RECOVERY (2007)
AA3039
AA3039'RECOVERY NOTE BY MAPTECH INCORPORATED 2007 (MAP)
AA3039'RECOVERED AS DESCRIBED.
**********************************************************************
AA3052  FBN        -  This is a Federal Base Network Control Station.
AA3052  DESIGNATION -  48 13
AA3052  PID        -  AA3052
AA3052  STATE/COUNTY-  AL/MARSHALL
AA3052  COUNTRY    -  US
AA3052  USGS QUAD  -  BOAZ (1983)
AA3052
AA3052                 *CURRENT SURVEY CONTROL
AA3052 ______________________________________________________________________
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AA3052* NAD 83(2007) POSITION- 34 13 55.83046(N) 086 12 16.21477(W) ADJUSTED
AA3052* NAD 83(2007) ELLIP HT- 294.226 (meters) (02/10/07) ADJUSTED
AA3052* NAD 83(2007) EPOCH - 2002.00
AA3052* NAVD 88 ORTHO HEIGHT - 323.311 (meters) 1060.73 (feet) ADJUSTED
AA3052 _____
AA3052 NAD 83(2007) X - 349,449.613 (meters) COMP
AA3052 NAD 83(2007) Y - -5,267,478.282 (meters) COMP
AA3052 NAD 83(2007) Z - 3,567,933.799 (meters) COMP
AA3052 LAPLACE CORR - 0.83 (seconds) DEFLEC09
AA3052 GEOID HEIGHT - -29.08 (meters) GEOID09
AA3052 DYNAMIC HEIGHT - 322.964 (meters) 1059.59 (feet) COMP
AA3052 MODELED GRAVITY - 979,553.7 (mgal) NAVD 88
AA3052
AA3052 VERT ORDER - SECOND CLASS I
AA3052
AA3052 FGDC Geospatial Positioning Accuracy Standards (95% confidence, cm)
AA3052 Type Horiz Ellip Dist(km)
AA3052 ----------
AA3052 NETWORK 0.79 1.71
AA3052 ----------
AA3052 MEDIAN LOCAL ACCURACY AND DIST (135 points) 1.10 2.47 212.46
AA3052 ----------
AA3052 NOTE: Click here for information on individual local accuracy
AA3052 values and other accuracy information.
AA3052
AA3052
AA3052.The horizontal coordinates were established by GPS observations
AA3052.and adjusted by the National Geodetic Survey in February 2007.
AA3052
AA3052.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
AA3052.See www.ngs.noaa.gov/web/surveys/NSRS2007 for more information.
AA3052
AA3052.The horizontal coordinates are valid at the epoch date displayed above
AA3052.which is a decimal equivalence of Year/Month/Day.
AA3052
AA3052.The orthometric height was determined by differential leveling and
AA3052.adjusted in September 2008.
AA3052
AA3052.No vertical observational check was made to the station.
AA3052
AA3052.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AA3052
AA3052.The Laplace correction was computed from DEFLEC09 derived deflections.
AA3052
AA3052.The ellipsoidal height was determined by GPS observations
AA3052.and is referenced to NAD 83.
AA3052
AA3052.The dynamic height is computed by dividing the NAVD 88
AA3052.geopotential number by the normal gravity value computed on the
AA3052.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
AA3052.degrees latitude (g = 980.6199 gals.).
AA3052

AA3052.The modeled gravity was interpolated from observed gravity values.
AA3052
AA3052. The following values were computed from the NAD 83(2007) position.
AA3052
AA3052; North East Units Scale Factor Converg.
AA3052;SPC AL E - 413,919.370 165,804.322 MT 0.99997441 -0 12 31.7
AA3052;UTM 16 - 3,788,185.700 573,262.724 MT 0.99966616 +0 26 51.1
AA3052
AA3052! - Elev Factor x Scale Factor = Combined Factor
AA3052!SPC AL E - 0.99995381 x 0.99997441 = 0.99992823
AA3052!UTM 16 - 0.99995381 x 0.99966616 = 0.99961999
AA3052
AA3052: Primary Azimuth Mark Grid Az
AA3052:SPC AL E - 48 12 169 59 37.1
AA3052:UTM 16 - 48 12 169 20 14.3
AA3052
AA3052|----------|
AA3052| PID Reference Object Distance Geod. Az |
AA3052| dddmmss.s |
AA3052| AA3051 48 12 422.593 METERS 1694705.4 |
AA3052|----------|
AA3052
AA3052 SUPERSEDED SURVEY CONTROL
AA3052
AA3052 NAD 83(1992)- 34 13 55.83046(N) 086 12 16.21464(W) AD( ) A
AA3052 ELLIP H (08/29/05) 294.246 (m) GP( ) 4 1
AA3052 ELLIP H (07/29/02) 294.202 (m) GP( ) 4 1
AA3052 NAD 83(1992)- 34 13 55.83070(N) 086 12 16.21512(W) AD( ) 1
AA3052 ELLIP H (03/30/95) 294.283 (m) GP( ) 4 2
AA3052 NAVD 88 (08/29/05) 323.3 (m) GEOID03 model used GPS OBS
AA3052 NGVD 29 (03/30/95) 323.3 (m) GEOID93 model used GPS OBS
AA3052
AA3052.Superseded values are not recommended for survey control.
AA3052.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AA3052.See file dsdata.txt to determine how the superseded data were derived.
AA3052
AA3052_U.S. NATIONAL GRID SPATIAL ADDRESS: 16SEC7326288185(NAD 83)
AA3052
AA3052_MARKER: DD = SURVEY DISK
AA3052_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
AA3052_SP_SET: CONCRETE POST
AA3052_STAMPING: 48-13 1993
AA3052_MARK LOGO: ALHD
AA3052_PROJECTION: FLUSH
AA3052_MAGNETIC: R = STEEL ROD IMBEDDED IN MONUMENT
AA3052_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AA3052+STABILITY: SURFACE MOTION
AA3052_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AA3052+SATELLITE: SATELLITE OBSERVATIONS - March 17, 2008
AA3052
AA3052 HISTORY - Date Condition Report By
AA3052 HISTORY - 1993 MONUMENTED ALHD

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AA3052  HISTORY    - 20010626 GOOD        ALHD
AA3052  HISTORY    - 20040331 GOOD        ALHD
AA3052  HISTORY    - 20040622 GOOD        LOCSUR
AA3052  HISTORY    - 20070913 GOOD        MAPTEC
AA3052  HISTORY    - 20080317 GOOD        ALADT
AA3052
AA3052                  STATION DESCRIPTION
AA3052
AA3052'DESCRIBED BY ALABAMA HIGHWAY DEPARTMENT 1993 (JLB)
AA3052'THE STATION IS IN MARSHALL COUNTY ON THE EAST RIGHT OF WAY OF A PAVED
AA3052'COUNTY ROAD IN ALBERTVILLE. TO REACH THE STATION FROM THE JUNCTION OF
AA3052'U.S. 431 AND AL 75 (MILEPOST 294.32 ON U.S. 431 AND MILEPOST 58.92 ON
AA3052'AL 75) IN ALBERTVILLE, DRIVE SOUTHWEST ON AL 75 FOR 1.05 MI (1.69 KM)
AA3052'TO MILEPOST 57.85 AND A FIVE WAY INTERSECTION AT A TRAFFIC LIGHT. BEAR
AA3052'LEFT ON BROAD STREET AND DRIVE SOUTH FOR 2.15 MI (3.46 KM) TO THE
AA3052'STATION ON THE LEFT. THE STATION IS 2.8 FT (0.9 M) WEST OF A FOUR
AA3052'STRAND BARBED WIRE FENCE ON RUSTY GREEN METAL POSTS WITH WHITE TOPS,
AA3052'21.8 FT (6.6 M) EAST OF THE CENTERLINE OF THE PAVED COUNTY ROAD, 56.4
AA3052'FT (17.2 M) EAST-SOUTHEAST OF A COMMUNITY WATCH SIGN ACROSS THE ROAD,
AA3052'80.5 FT (24.5 M) SOUTHEAST OF THE CENTER OF A GRAVEL DRIVEWAY LEADING
AA3052'TO A BROWN WOOD FRAME HOUSE WITH A BROWN SHINGLE ROOF ACROSS THE ROAD,
AA3052'88.7 FT (27.0 M) SOUTH OF THE CENTER OF A GRAVEL DRIVEWAY LEADING TO A
AA3052'DOUBLE METAL GATE, 96.5 FT (29.4 M) SOUTHEAST OF A JUNCTION POWER AND
AA3052'CABLE POLE WITH ONE TRANSFORMER ACROSS THE ROAD, 101.0 FT (30.8 M)
AA3052'SOUTH OF THE CENTER OF A DOUBLE METAL GATE LEADING INTO A FIELD, 117.6
AA3052'FT (35.8 M) SOUTH OF A POWER POLE, 3.1 FT (0.9 M) WEST OF A CARSONITE
AA3052'WITNESS POST AND SET FLUSH WITH THE GROUND. STATION 48-12 1993 MAY BE
AA3052'USED AS AN AZIMUTH FOR THIS STATION.
AA3052
AA3052                  STATION RECOVERY (2001)
AA3052
AA3052'RECOVERY NOTE BY ALABAMA HIGHWAY DEPARTMENT 2001 (JDS)
AA3052'RECOVERED IN GOOD CONDITION.
AA3052
AA3052                  STATION RECOVERY (2004)
AA3052
AA3052'RECOVERY NOTE BY ALABAMA HIGHWAY DEPARTMENT 2004 (JDS)
AA3052'RECOVERED IN GOOD CONDITION.
AA3052
AA3052                  STATION RECOVERY (2004)
AA3052
AA3052'RECOVERY NOTE BY LOCAL SURVEYOR (INDIVIDUAL OR FIRM) 2004 (JJB)
AA3052'RECOVERED AS DESCRIBED.
AA3052
AA3052                  STATION RECOVERY (2007)
AA3052
AA3052'RECOVERY NOTE BY MAPTECH INCORPORATED 2007 (MAP)
AA3052'RECOVERED AS DESCRIBED.
AA3052
AA3052                  STATION RECOVERY (2008)
AA3052
AA3052'RECOVERY NOTE BY ALABAMA DEPT OF TRANSPORTATION 2008 (JDS)
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AA3052'RECOVERED IN GOOD CONDITION.

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 AA3047  DESIGNATION -  48 8
 AA3047  PID        -  AA3047
 AA3047  STATE/COUNTY-  AL/MARSHALL
 AA3047  COUNTRY    -  US
 AA3047  USGS QUAD  -  ARAB (1973)
 AA3047
 AA3047                  *CURRENT SURVEY CONTROL
 AA3047 ______________________________________________________________________
 AA3047* NAD 83(2007) POSITION- 34 15 32.46740(N) 086 25 31.47258(W)   ADJUSTED
 AA3047* NAD 83(2007) ELLIP HT-   172.050 (meters)       (02/10/07)   ADJUSTED
 AA3047* NAD 83(2007) EPOCH   -  2002.00
 AA3047* NAVD 88 ORTHO HEIGHT -   201.005  (meters)    659.46  (feet) ADJUSTED
 AA3047 ______________________________________________________________________
 AA3047  NAD 83(2007) X -    329,027.430 (meters)                COMP
 AA3047  NAD 83(2007) Y  - -5,267,013.177 (meters)                COMP
 AA3047  NAD 83(2007) Z  -  3,570,326.580 (meters)                COMP
 AA3047  LAPLACE CORR   -        -3.19  (seconds)              DEFLEC09
 AA3047  GEOID HEIGHT   -       -28.95  (meters)               GEOID09
 AA3047  DYNAMIC HEIGHT -       200.794 (meters)     658.77  (feet) COMP
 AA3047  MODELED GRAVITY -    979,580.1   (mgal)                NAVD 88
 AA3047
 AA3047  VERT ORDER     -  SECOND    CLASS I
 AA3047
 AA3047  FGDC Geospatial Positioning Accuracy Standards (95% confidence, cm)
 AA3047  Type                           Horiz  Ellip  Dist(km)
 AA3047  ----------------------------------------------------------------
 AA3047  NETWORK                          0.91   1.92
 AA3047  ----------------------------------------------------------------
 AA3047  MEDIAN LOCAL ACCURACY AND DIST (006 points)   1.06   2.00     11.79
 AA3047  ----------------------------------------------------------------
 AA3047  NOTE: Click here for information on individual local accuracy
 AA3047  values and other accuracy information.
 AA3047
 AA3047
 AA3047.The horizontal coordinates were established by GPS observations
 AA3047.and adjusted by the National Geodetic Survey in February 2007.
 AA3047
 AA3047.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 AA3047.See www.ngs.noaa.gov/web/surveys/NSRS2007 for more information.
 AA3047
 AA3047.The horizontal coordinates are valid at the epoch date displayed above
 AA3047.which is a decimal equivalence of Year/Month/Day.
 AA3047
 AA3047.The orthometric height was determined by differential leveling and
 AA3047.adjusted in September 2008.
 AA3047
 AA3047.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AA3047
 AA3047.The Laplace correction was computed from DEFLEC09 derived deflections.
 AA3047
 AA3047.The ellipsoidal height was determined by GPS observations
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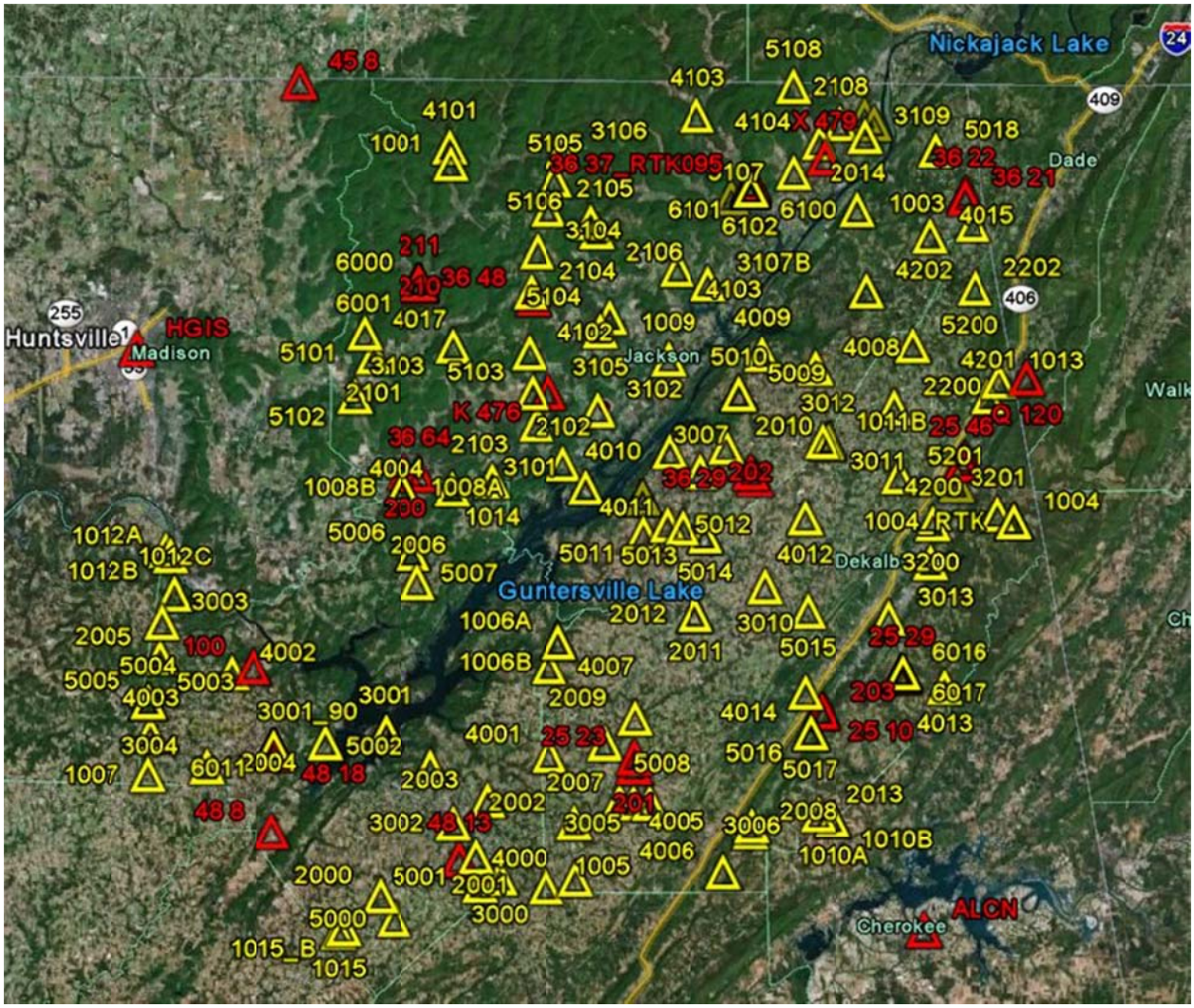
AA3047.and is referenced to NAD 83.
AA3047
AA3047.The dynamic height is computed by dividing the NAVD 88
AA3047.geopotential number by the normal gravity value computed on the
AA3047.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
AA3047.degrees latitude (g = 980.6199 gals.).
AA3047
AA3047.The modeled gravity was interpolated from observed gravity values.
AA3047
AA3047. The following values were computed from the NAD 83(2007) position.
AA3047
AA3047; North East Units Scale Factor Converg.
AA3047;SPC AL E - 416,993.227 145,469.616 MT 0.99999664 -0 19 59.9
AA3047;UTM 16 - 3,791,025.393 552,900.958 MT 0.99963450 +0 19 24.5
AA3047
AA3047! - Elev Factor x Scale Factor = Combined Factor
AA3047!SPC AL E - 0.99997299 x 0.99999664 = 0.99996963
AA3047!UTM 16 - 0.99997299 x 0.99963450 = 0.99960750
AA3047
AA3047: Primary Azimuth Mark Grid Az
AA3047:SPC AL E - 48 9 044 19 13.4
AA3047:UTM 16 - 48 9 043 39 49.0
AA3047
AA3047|---|
AA3047| PID Reference Object Distance Geod. Az |
AA3047| dddmmss.s |
AA3047| AA3048 48 9 458.009 METERS 0435913.5 |
AA3047|---|
AA3047
AA3047 SUPERSEDED SURVEY CONTROL
AA3047
AA3047 ELLIP H (07/29/02) 172.019 (m) GP( ) 4 1
AA3047 NAD 83(1992)- 34 15 32.46773(N) 086 25 31.47257(W) AD( ) 1
AA3047 ELLIP H (03/30/95) 172.104 (m) GP( ) 4 2
AA3047 NGVD 29 (03/30/95) 201.0 (m) GEOID93 model used GPS OBS
AA3047
AA3047.Superseded values are not recommended for survey control.
AA3047.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AA3047.See file dsdata.txt to determine how the superseded data were derived.
AA3047
AA3047_U.S. NATIONAL GRID SPATIAL ADDRESS: 16SEC5290091025(NAD 83)
AA3047
AA3047_MARKER: DD = SURVEY DISK
AA3047_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
AA3047_SP_SET: CONCRETE POST
AA3047_STAMPING: 48-8 1993
AA3047_MARK LOGO: ALHD
AA3047_PROJECTION: FLUSH
AA3047_MAGNETIC: R = STEEL ROD IMBEDDED IN MONUMENT
AA3047_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AA3047+STABILITY: SURFACE MOTION
AA3047_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

AA3047+SATELLITE: SATELLITE OBSERVATIONS - August 09, 2007
AA3047
AA3047 HISTORY   - Date   Condition   Report By
AA3047 HISTORY   - 1993   MONUMENTED   ALHD
AA3047 HISTORY   - 20040331 GOOD   ALHD
AA3047 HISTORY   - 20070809 GOOD   MAPTEC
AA3047
AA3047   STATION DESCRIPTION
AA3047
AA3047'DESCRIBED BY ALABAMA HIGHWAY DEPARTMENT 1993 (JLB)
AA3047'THE STATION IS IN MARSHALL COUNTY ON THE NORTH RIGHT OF WAY OF A PAVED
AA3047'COUNTY ROAD ABOUT 5.60 MI (9.01 KM) SOUTHEAST OF ARAB AND ABOUT 9.20
AA3047'MI (14.81 KM) SOUTHWEST OF GUNTERSVILLE. TO REACH THE STATION FROM THE
AA3047'JUNCTION OF U.S. 431 AND AL 79 SOUTH (MILEPOST 302.25 ON U.S. 431 AND
AA3047'MILEPOST 66.19 ON AL 79) IN GUNTERSVILLE, DRIVE SOUTHWEST ON AL 79 FOR
AA3047'1.85 MI (2.98 KM) TO MILEPOST 64.35 AND A PAVED COUNTY ROAD RIGHT.
AA3047'TURN RIGHT ON THE PAVED COUNTY ROAD AND DRIVE WEST AND SOUTHWEST FOR
AA3047'5.00 MI (8.05 KM) TO A T-INTERSECTION WITH MARSHALL COUNTY ROAD 14
AA3047'LEFT AND RIGHT. TURN LEFT ON MARSHALL COUNTY ROAD 14 AND DRIVE
AA3047'SOUTHWEST FOR 2.30 MI (3.70 KM) TO A PAVED COUNTY ROAD RIGHT. TURN
AA3047'RIGHT ON THE PAVED COUNTY ROAD AND DRIVE WEST FOR 0.15 MI (0.24 KM) TO
AA3047'THE STATION ON THE RIGHT. THE STATION IS 3.8 FT (1.2 M) SOUTH OF A
AA3047'FIVE STRAND STRAIGHT WIRE FENCE ON WOOD POSTS, 22.1 FT (6.7 M) NORTH
AA3047'OF THE CENTER OF A PAVED COUNTY ROAD, 136.5 FT (41.6 M) WEST OF A
AA3047'POWER AND CABLE POLE, 178.0 FT (54.3 M) EAST OF A POWER AND CABLE
AA3047'POLE, 195.4 FT (59.6 M) EAST OF A GRAVEL DRIVEWAY LEADING TO A GRAY
AA3047'WOOD FRAME HOUSE WITH A TIN ROOF, 3.8 FT (1.2 M) WEST OF A CARSONITE
AA3047'WITNESS POST AND SET FLUSH WITH THE GROUND. STATION 48-9 1993 MAY BE
AA3047'USED AS AN AZIMUTH FOR THIS STATION.
AA3047
AA3047   STATION RECOVERY (2004)
AA3047
AA3047'RECOVERY NOTE BY ALABAMA HIGHWAY DEPARTMENT 2004 (JDS)
AA3047'RECOVERED IN GOOD CONDITION.
AA3047
AA3047   STATION RECOVERY (2007)
AA3047
AA3047'RECOVERY NOTE BY MAPTECH INCORPORATED 2007 (MAP)
AA3047'RECOVERED AS DESCRIBED.

SECTION 5: GPS CONTROL DIAGRAM

This section contains a graphical representation of the new and existing control stations used for the Jackson, Marshall and DeKalb Counties Airborne LiDAR Survey Project. Stations shown in red are the GPS base stations and geodetic control used.



Not to Scale

AIRBORNE LIDAR REPORT

MARSHALL, JACKSON, & DEKALB COUNTIES, ALABAMA LIDAR

Woolpert Project Number: 71899
August 2012

WOOLPERT
DESIGN | GEOSPATIAL | INFRASTRUCTURE

AIRBORNE LIDAR TASK ORDER REPORT

MARSHALL, JACKSON & DEKALB COUNTIES, ALABAMA LIDAR

WOOLPERT PROJECT #71899

For:

United States Army Corps of Engineers
(USACE)
Mobile District P.O. Box 228
St. Joseph Street
Mobile, Alabama 36628

By:

Woolpert
4454 Idea Center Boulevard
Dayton, OH 45430-1500
Tel 937.461.5660

Summary of Contents

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SECTION 1: OVERVIEW

PROJECT NAME: JACKSON, MARSHALL, DEKALB COUNTY, ALABAMA LIDAR

WOOLPERT PROJECT #71899

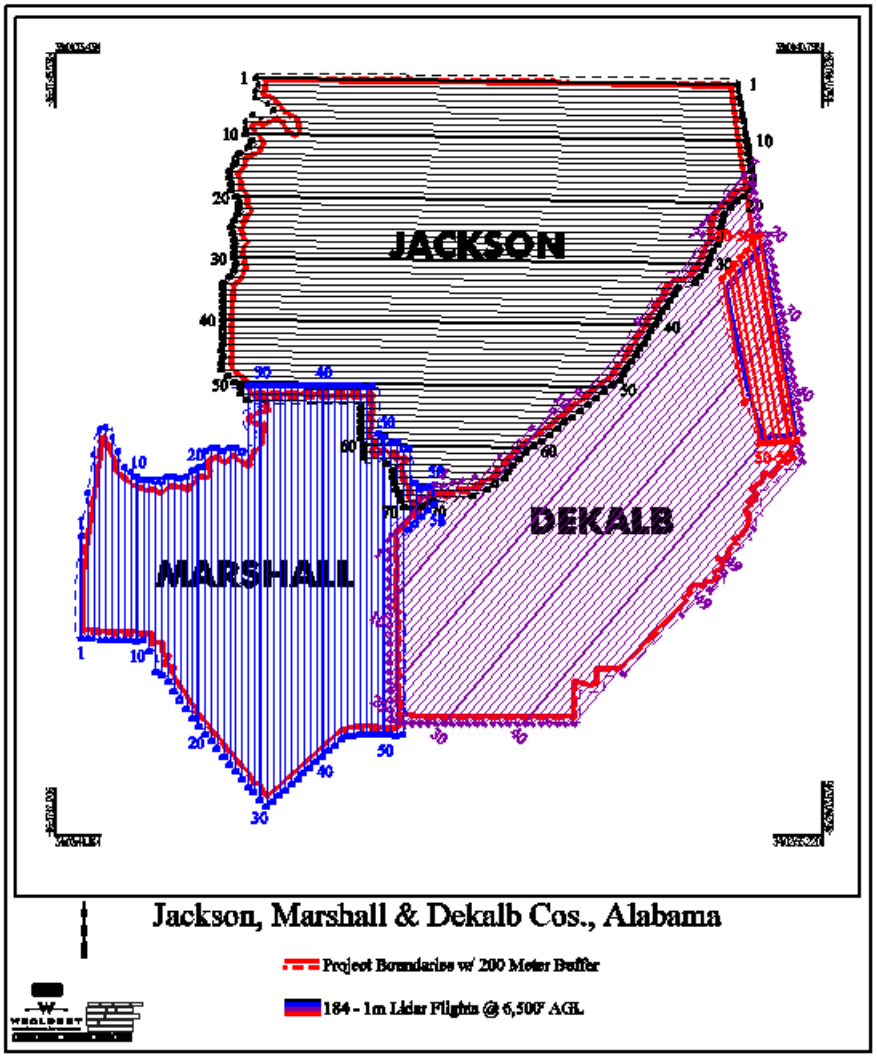
This report contains a comprehensive outline of the airborne LiDAR data acquisition consisting of Jackson, Marshall and Dekalb Counties in Alabama, for the United States Army Corps of Engineers Mobile Division (USACE). The LiDAR was collected and processed to meet a maximum Nominal Post Spacing (NPS) of 1 meter. The NPS assessment is made against single swath, first return data located within the geometrically usable center portion (typically ~90%) of each swath.

The data was collected using a Leica ALS60 200 kHz Multiple Pulses in Air (MPiA) LiDAR sensor installed in a shock isolator sled mount. The ALS60 200 kHz sensor collects up to four returns (echos) per pulse, recording attributes such as time stamp and intensity data, for the first three returns. If a fourth return was captured, the system does not record an associated intensity value. The aerial LiDAR was collected at the following sensor specifications:

Post Spacing (Minimum):	3.28 ft / 1 m
AGL (Above Ground Level) average flying height:	6,500 ft / 1,981 m
MSL (Mean Sea Level) average flying height:	7,050 ft / 2,149 m
*note: Dekalb County flights 50-56 flown at 8,400'MSL	
Average Ground Speed:	130 knots / 150 mph
Field of View (full):	40 degrees
Pulse Rate:	115.6 kHz
Scan Rate:	41.8 Hz
Side Lap (Minimum):	25%

LiDAR data was processed and projected in State Plane Alabama East, North American Datum of 1983 (NAD83) in units of feet. The vertical datum used for the task order was referenced to NAVD 1988, U.S. survey feet, Geoid09.

Figure 1.1 Task Order and LiDAR Flight Layout – Jackson, Marshall, Dekalb Counties, Alabama



SECTION 2: ACQUISITION

The LiDAR data was acquired with a Leica ALS60 200 kHz Multiple Pulses in Air (MPiA) LiDAR sensor system, on board a Cessna 404. The ALS60 LiDAR system, developed by Leica Geosystems of Heerbrugg, Switzerland, includes the simultaneous first, intermediate and last pulse data capture module, the extended altitude range module, and the target signal intensity capture module. The system software is operated on an OC50 Operation Controller aboard the aircraft.

The ALS60 200 kHz Multiple Pulses in Air (MPiA) LiDAR System has the following specifications:

Table 2.1 ALS60 LiDAR System Specifications

Specification	
Operating Altitude	200 - 6,000 meters
Scan Angle	0 to 75° (variable)
Swath Width	0 to 1.5 X altitude (variable)
Scan Frequency	0 – 100 Hz (variable based on scan angle)
Maximum Pulse Rate	200 kHz
Range Resolution	Better than 1 cm
Elevation Accuracy	8 – 24 cm single shot (one standard deviation)
Horizontal Accuracy	7 – 64 cm (one standard deviation)
Number of Returns per Pulse	4 (first, second, third, last)
Number of Intensities	3 (first, second, third)
Intensity Digitization	8 bit intensity + 8 bit AGC (Automatic Gain Control) level
MPiA (Multiple Pulses in Air)	8 bits @ 1nsec interval @ 50kHz
Laser Beam Divergence	0.22 mrad @ $1/e^2$ (~0.15 mrad @ 1/e)
Laser Classification	Class IV laser product (FDA CFR 21)
Eye Safe Range	400m single shot depending on laser repetition rate
Roll Stabilization	Automatic adaptive, range = 75 degrees minus current FOV
Power Requirements	28 VDC @ 25A
Operating Temperature	0-40°C
Humidity	0-95% non-condensing
Supported GNSS Receivers	Ashtech Z12, Trimble 7400, Novatel Millenium

Prior to mobilizing to the task order site, Woolpert flight crews coordinated with the necessary Air Traffic Control personnel to ensure airspace access.

Woolpert survey crews were onsite, operating a Global Navigation Satellite System (GNSS) Base Station at the Albertville Regional Airport- Thomas J. Brumlik Field (8A0) for the airborne GPS support on days 00412, 00515 and 00612. Coordinates: 34°13'54.73204" (N), 86°14'54.03337" (W), Elipsoid Height 286.142 meters.

Woolpert survey crews were onsite, operating a Global Navigation Satellite System (GNSS) Base Station at Isbell Field Airport (4A9) for the airborne GPS support on days 01412, 01512, 01812 and 01812. Coordinates: 34°28'24.38814" (N), 85°43'12.22404" (W), Elipsoid Height 241.011 meters.

Woolpert survey crews were onsite, operating a Global Navigation Satellite System (GNSS) Base Station at Scottsboro Municipal Airport- Word Field (4A6) for the airborne GPS support on days 01512 and 07812. Coordinates: 34°41'14.70066" (N), 86°00'18.68174" (W), Elipsoid Height 167.757 meters.

The LiDAR data was collected in (9) missions

An initial quality control process was performed immediately on the LiDAR data to review the data coverage, airborne GPS data, and trajectory solution. Any gaps found in the LiDAR data were relayed to the flight crew, and the area was re-flown.

Table 2.2 Airborne LiDAR Acquisition Flight Summary

Airborne LiDAR Acquisition Flight Summary			
Date of Mission	Lines Flown	Mission Time (UTC) Wheels Up/ Wheels Down	Mission Time (Local = EDT) Wheels Up/ Wheels Down
Jan 4, 2012 – S/N 77	1-17	21:45 – 01:21	03:45 PM – 07:21 PM
Jan 5, 2012 – S/N 77	18-40	16:35 – 23:09	10:35 AM – 05:09 PM
Jan 6 , 2012 – S/N 77	41-58	16:59 – 21:02	10:59 AM – 03:02 PM
Jan 14, 2012 – S/N 77 A	49, 52, 53, 15-24	17:19 – 20:04	11:19 AM – 04:04 PM
Jan 14, 2012 – S/N 6157 B	33-56	16:06 – 22:52	11:06 AM – 05:52 PM
Jan 15, 2012 – S/N 77 A	1–14, 50-70	15:12 – 21:23	09:12 AM – 03:23 PM
Jan 15, 2012 – S/N 6157 B	25-32. 1-10	13:33 – 21:16	07:33 AM – 03:16 PM
Jan 18, 2012 – S/N 77 A	32-49	21:23 – 03:00	03:23 PM – 09:00 PM
Jan 18, 2012 – S/N 6157 B	11-32	20:50 – 05:25	02:50 PM – 11:25 PM

SECTION 3: LIDAR DATA PROCESSING

APPLICATIONS AND WORK FLOW OVERVIEW

1. Resolved kinematic corrections for three subsystems: inertial measurement unit (IMU), sensor orientation information and airborne GPS data. Developed a blending post-processed aircraft position with attitude data using Kalman filtering technology or the smoothed best estimate trajectory (SBET).
   Software: POSPac Software v. 5.3, IPAS Pro v.1.35.

2. Calculated laser point position by associating the SBET position to each laser point return time, scan angle, intensity, etc. Created raw laser point cloud data for the entire survey in .LAS format. Automated line-to-line calibrations were then performed for system attitude parameters (pitch, roll, heading), mirror flex (scale) and GPS/IMU drift.
   Software: ALS Post Processing Software v.2.70, Proprietary Software, TerraMatch v. 12.01.

3. Imported processed .LAS point cloud data into the task order tiles. Resulting data were classified as ground and non-ground points with additional filters created to meet the task order classification specifications. Statistical absolute accuracy was assessed via direct comparisons of ground classified points to ground RTK survey data. Based on the statistical analysis, the LiDAR data was then adjusted to reduce the vertical bias when compared to the survey ground control.
   Software: TerraScan v.12.005.

4. The .LAS files were evaluated through a series of manual QA/QC steps to eliminate remaining artifacts and small undulations from the ground class.
   Software: TerraScan v.12.005.

5. All water bodies greater than two acres and all rivers with a nominal 100 foot width or larger were hydro-flattened using stereo compilation methods.
   Software: Summit Evolution v6.4, Microstation v8**,** TerraScan v.12.005.

GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS)-INERTIAL MEASUREMENT UNIT (IMU) TRAJECTORY PROCESSING

EQUIPMENT

Flight navigation during the LiDAR data acquisition mission is performed using IGI CCNS (Computer Controlled Navigation System). The pilots are skilled at maintaining their planned trajectory, while holding the aircraft steady and level. If atmospheric conditions are such that the trajectory, ground speed, roll, pitch and/or heading cannot be properly maintained, the mission is aborted until suitable conditions occur.

The aircraft are all configured with a NovAtel Millennium 12-channel, L1/L2 dual frequency Global Navigation Satellite System (GNSS) receivers collecting at 2 Hz.

All Woolpert aerial sensors are equipped with a Litton LN200 series Inertial Measurement Unit (IMU) operating at 200 Hz.

A base-station unit was mobilized for each acquisition mission, and was operated by a member of the Woolpert survey crew. Each base-station setup consisted of one Trimble 4000 – 5000 series dual frequency receiver, one Trimble Compact L1/L2 dual frequency antenna, one 2-meter fixed-height tripod, and essential battery power and cabling. Ground planes were used on the base-station antennas. Data was collected at 1 or 2 Hz.

Woolpert survey crews were onsite, operating a Global Navigation Satellite System (GNSS) Base Station at the Albertville Regional Airport- Thomas J. Brumlik Field (8A0), Isbell Field Airport (4A9) and Scottsboro Municipal Airport- Word Field (4A6) for airborne GPS support.

The GNSS base stations operated during the LiDAR acquisition missions are listed below:

Table 3.1: GNSS Base Stations

Station	Latitude	Longitude	Ellipsoid Height (L1 Phase Center)
Name	(DMS)	(DMS)	(Meters)
8A0	N 34°13'54.73	W 86°14'54.03	286.142
4A9	N 34°28'24.38	W 85°43'12.22	241.011
4A6	N 34°41'14.70	W 86° 00' 18.68	167.757

DATA PROCESSING

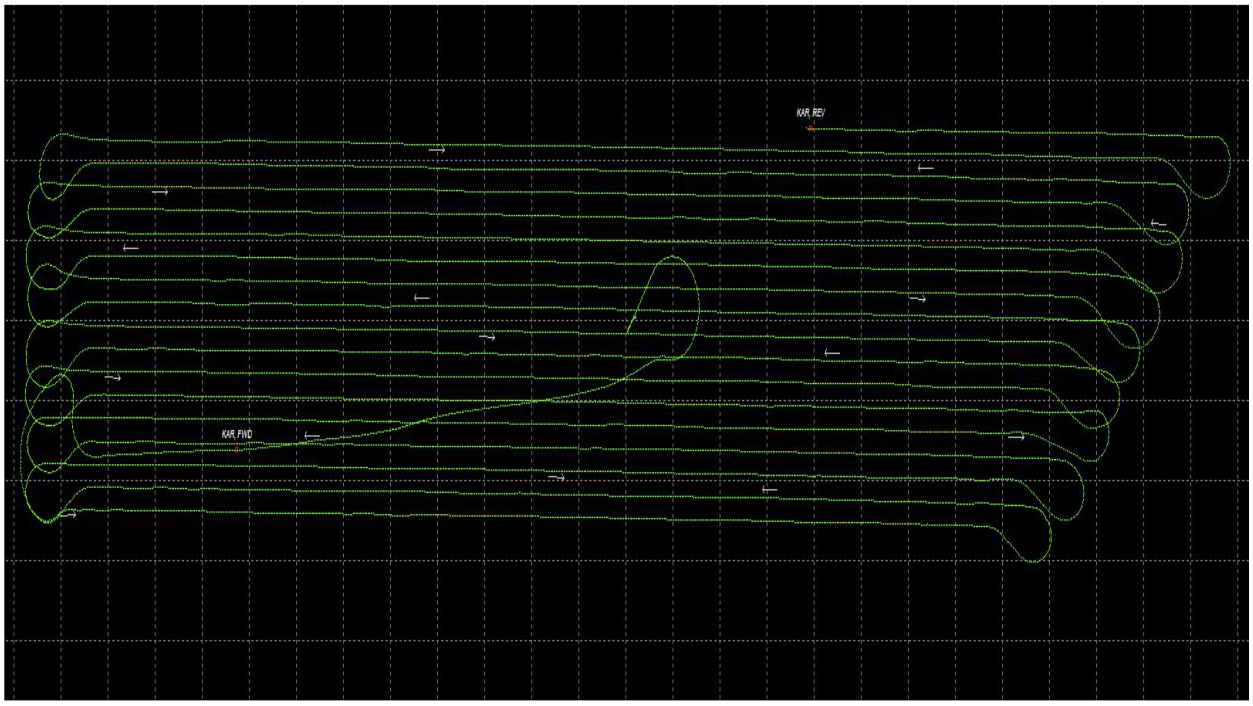
All airborne GNSS and IMU data was post-processed and quality controlled using Applanix 5.3 MMS software. GNSS data was processed at a 1 and 2 Hz data capture rate and the IMU data was processed at 200 Hz.

TRAJECTORY QUALITY

The GNSS Trajectory, along with high quality IMU data are key factors in determining the overall positional accuracy of the final sensor data. See **Figure 3.1** for the flight trajectory.

Flight Trajectory

Figure 3.1: Representative Graph from Day 01812



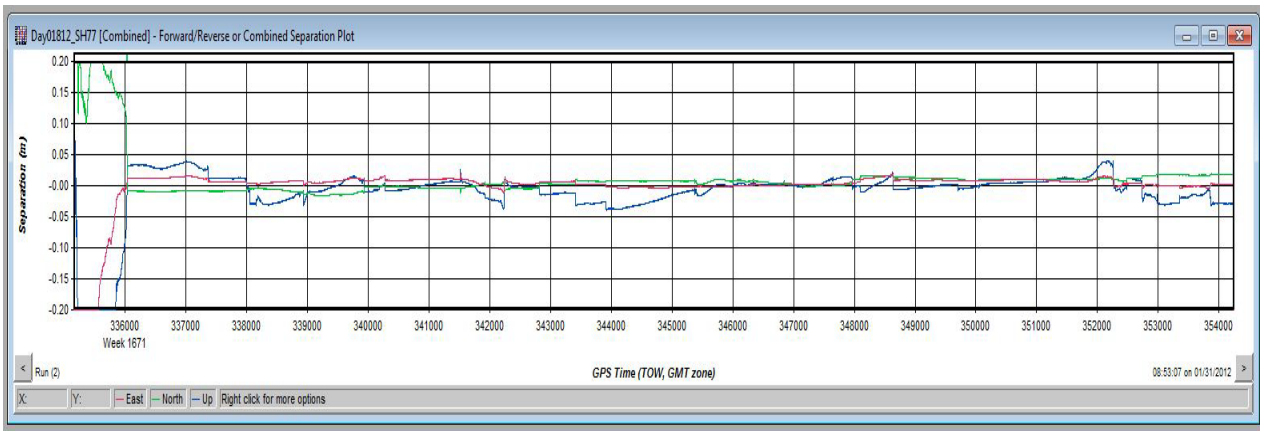
Within the trajectory processing, there are many factors that affect the overall quality, but the most indicative are the Combined Separation, the Estimated Positional Accuracy, and the Positional Dilution of Precision (PDOP).

Combined Separation

The Combined Separation is a measure of the difference between the forward run and the backward run solution of the trajectory. The Kalman filter is processed in both directions to remove the combined directional anomalies. In general, when these two solutions match closely, an optimally accurate reliable solution is achieved.

Woolpert's goal is to maintain a Combined Separation Difference of less than ten (10) centimeters. In most cases we achieve results below this threshold. See **Figure 3.2** for the combined separation graph.

Figure 3.2: Representative Graph from Day 01812 of Combined Separation

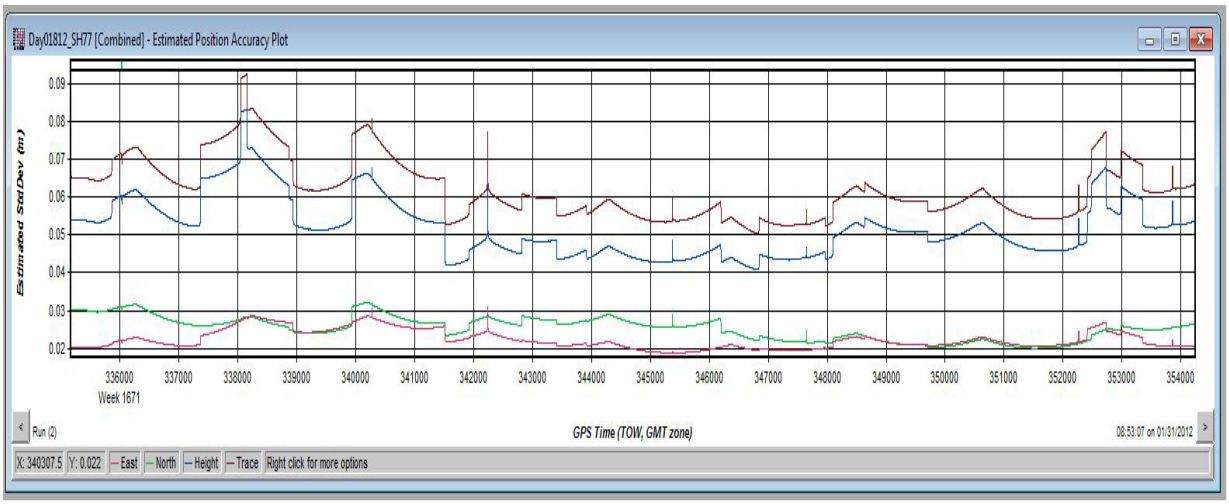


Estimated Positional Accuracy

The Estimated Positional Accuracy plots the standard deviations of the east, north, and vertical directions along a time scale of the trajectory. It illustrates loss of satellite lock issues, as well as issues arising from long baselines, noise, and/or other atmospheric interference.

Woolpert's goal is to maintain an Estimated Positional Accuracy of less than ten (10) centimeters, often achieving results well below this threshold.

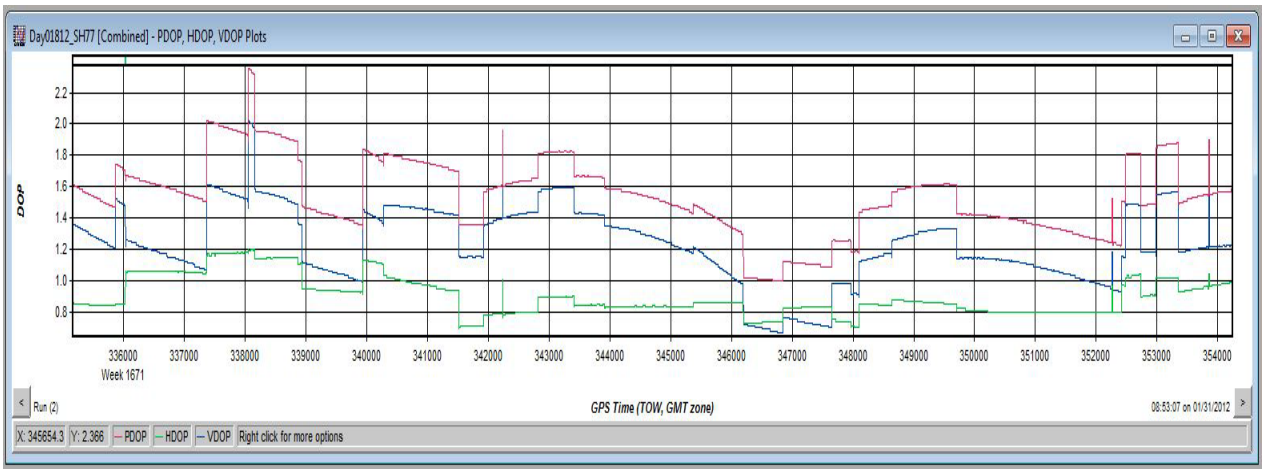
Figure 3.3: Representative Graph from Day 01812 of Positional Accuracy



PDOP

Position Dilution of precision (DOP) is a measure of the quality of the GPS data being received from the satellites. Woolpert's goal is to maintain an average PDOP of 3 or less.

Figure 3.4: Representative Graph from Day 01812 of PDOP



LIDAR DATA PROCESSING

When the sensor calibration, data acquisition, and GPS processing phases were complete, the formal data reduction processes by Woolpert LiDAR specialists included:

- Processed individual flight lines to derive a raw "Point Cloud" LAS file. Matched overlapping flight lines, generated statistics for evaluation comparisons, and made the necessary adjustments to remove any residual systematic error.
- Calibrated LAS files were imported into the task order tiles and initially filtered to create a ground and non-ground class. Then additional classes were filtered as necessary to meet client specified classes.
- Once all of the task order data was imported and classified, cross flights and survey ground control data was imported and calculated for an accuracy assessment. As a QA/QC measure, Woolpert has developed a routine to generate accuracy statistical reports by comparison among LiDAR points, ground control, and TINs. The LiDAR is adjusted accordingly to reduce any vertical bias to meet or exceed the vertical accuracy requirements.
- The LiDAR tiles were reviewed using a series of proprietary QA/QC procedures to ensure it fulfills the task order requirements. A portion of this requires a manual step to ensure anomalies have been removed from the ground class.
- The bare earth DEM surface was hydrologically flattened for waterbody features that were greater than 2 acres and rivers and streams of 100 feet and greater nominal width.
- The LiDAR LAS files for this task order have been classified into the Default (Class 1), Ground (Class 2), Noise (Class 7), Water (Class 9), Breakline Buffer (class 10) and Overlap (Class 12)

classifications.

- FGDC Compliant metadata was developed for the task order in .xml format for the final data products.

- The horizontal datum used for the task order was referenced to State Plane Alabama East, North American Datum of 1983. Coordinate positions were specified in units of feet for the Alabama project. The vertical datum used for the task order was referenced to NAVD 1988, U.S. survey feet, Geoid09.

SECTION 4: HYDROLOGIC FLATTENING AND FINAL QUALITY CONTROL

HYDROLOGIC FLATTENING OF LIDAR DEM DATA

This task required the compilation of breaklines defining water bodies and rivers. The breaklines were used to perform the hydrologic flattening of water bodies, and gradient hydrologic flattening of water bodies. Provided to USACE is all water bodies falling within the predetermined 100 year flood plain zone, hydro-flattened using stereo compilation methods. Provided to USGS will be all aforementioned breaklines along with all water bodies greater than two acres and all rivers with a nominal 30.5 meters (100 foot) width or larger, hydrologically flattened using proprietary methods. Closed water bodies were collected at a constant elevation. Rivers and streams were compiled in the direction of flow with both sides of the stream maintaining an equal gradient elevation.

LIDAR DATA REVIEW AND PROCESSING

Woolpert utilized the following steps to hydrologically flatten the water bodies and for gradient hydrologic flattening of the double line streams within the existing LiDAR data.

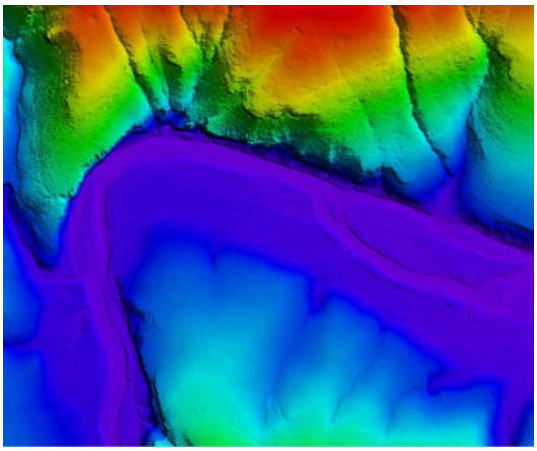
1. Woolpert used the ADS stereo imagery in combination with contours generated from the LiDAR acquired to analyze the water needed to be collected.

2. To make sure that the water was compiled correctly, we used contours generated from the raw LiDAR, using Terrascan and Terramodeler, to assist with the determination of the elevation of the water in combination with the stereo imagery, using Summit Evolution v6.4 and Microstation V8. This is to help determine the elevation of the water and help with the horizontal placement of the line. (Vegetation could be obscuring)

3. Provided to USACE is all water bodies falling within the predetermined 100 year flood plain zone, hydro-flattened using stereo compilation methods. Provided to USGS will be all aforementioned breaklines along with all water bodies greater than two acres and all rivers with a nominal 30.5 meters (100 foot) width or larger, hydrologically flattened using proprietary methods.

4. In addition to the water collection, 2' contours were generated from the ground points of the LiDAR. Breaklines were supplemented to enforce the contour accuracy. All waterlines and breaklines were included in the final contour generation.

Figure 4.1 Hydrologic Breakline Enforced DEM



1. All ground points were reclassified from inside the hydrologic feature polygons to water, class nine (9).

2. All ground points were reclassified from within a 1.5 meter (5 foot) buffer along the hydrologic feature breaklines to buffered ground, class ten (10).

3. The LiDAR ground points and hydrologic feature breaklines were used to generate a new digital elevation model (DEM).

Figure 4.2

Figure 4.3

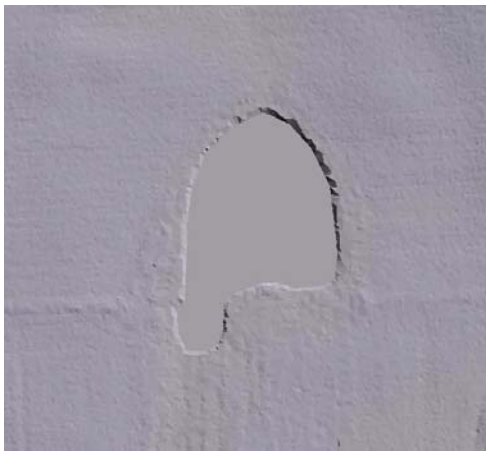


Figure 4.2 reflects a DEM generated from original LiDAR bare earth point data prior to the hydrologic flattening process. Note the "tinning" across the lake surface.

Figure 4.3 reflects a DEM generated from LiDAR with breaklines compiled to define the hydrologic features. This figure illustrates the results of adding the breaklines to hydrologically flatten the DEM data. Note the smooth appearance of the lake surface in the DEM.

Terrascan was used to add the hydrologic breakline vertices and export the lattice models. The hydrologically flattened DEM data was provided to USACE in ERDAS IMG format at a 4-foot cell size. The hydrologic breaklines compiled as part of the flattening process are provided as an ESRI shapefile.

DATA QA/QC

Initial QA/QC for this task order was performed in Global Mapper v14, by reviewing the grids and hydrologic breakline features.

Edits and corrections were addressed individually by tile. If a water body breakline needed to be adjusted to improve the flattening of the IMG DEM, the area was cross referenced by tile number, corrected accordingly, a new IMG DEM was regenerated and then reviewed in Global Mapper.

SECTION 5: FINAL ACCURACY ASSESSMENT

FINAL VERTICAL ACCURACY ASSESSMENT

The vertical accuracy statistics were calculated by comparison of the LiDAR bare earth points to independent ground surveyed QA/QC points.

Table 5.1: Swath Vertical Accuracy Statistics, COE Jackson, Marshall, DeKalb Counties AL		
Average error	-0.016	feet
Minimum error	-0.403	feet
Maximum error	+0.265	feet
Average magnitude	0.105	feet
Root mean square	0.144	feet
Standard deviation	0.146	feet

Table 5.2: Swath LiDAR QA/QC Analysis, STATE PLANE ALABAMA EAST, NAD83, COE Jackson, Marshall, DeKalb Counties AL

Point ID	Easting (UTM meters)	Northing (UTM meters)	Elevation (meters)	Dz (meters)
2000	515555.9	1345145	970.877	0.123
2001	551243.5	1348837	1013.011	0.249
2002	584918.3	1370979	1120.143	-0.053
2003	553953.8	1378982	989.183	0.167
2004	496272.7	1399447	640.813	0.047
2005	437778.7	1429816	914.603	-0.193
2006	529383.6	1456119	1215.095	-0.205
2007	605851	1377959	1129.852	-0.002
2008	647525.5	1367570	719.064	0.036
2009	606492.6	1407839	1170.496	-0.126
2010	639312.3	1503784	1405.681	-0.151
2011	628142.1	1444439	1272.25	-0.03
2012	627993	1444825	1269.246	0.204
2013	671402.5	1373679	1222.779	-0.089
2014	685955.1	1587458	1523.508	-0.028
2101	513536.6	1535985	603.127	-0.117
2102	581184.5	1497943	617.522	-0.032
2103	571579.5	1512093	615.758	-0.018
2104	569833.1	1558863	1584.569	-0.079
2105	575990.2	1587823	1704.871	0.039
2106	593394.7	1579899	1685.685	0.265
2107	641276.8	1591816	633.509	0.011
2108	679969.2	1618161	677.879	-0.039

Table 5.2: Swath LiDAR QA/QC Analysis, STATE PLANE ALABAMA EAST, NAD83, COE Jackson, Marshall, DeKalb Counties AL				
Point ID	Easting (UTM meters)	Northing (UTM meters)	Elevation (meters)	Dz (meters)
2200	698830.3	1517629	1553.303	-0.403
2201	720821.1	1490165	999.611	0.009
2202	727563.5	1559854	1614.206	0.004

VERTICAL ACCURACY CONCLUSIONS

LAS data covering the USACE Airborne Lidar Survey for Jackson, Marshall, and Dekalb Counties, AL Task Order was compared to survey control points to determine the FVA of the LAS Swath and of the Bare-Earth DEM. In addition, this LAS data was compared to supplemental points from categories: Bare Earth Open Terrain, Tall Weeds/Crops, Brush Lands and Trees, Urban, and Forested Fully Grown. LAS Swath Fundamental Vertical Accuracy (FVA) Tested 0.282 survey feet fundamental vertical accuracy at a 95 percent confidence level, derived according to NSSDA, in open terrain using 0.144 feet (RMSE(z)) x 1.96000 tested against the TIN. Bare-Earth DEM Fundamental Vertical Accuracy (FVA) Tested 0.307 feet fundamental vertical accuracy at a 95 percent confidence level, derived according to NSSDA, in open terrain using 0.157 feet (RMSE(z)) x 1.96000 tested against the DEM.

SUPPLEMENTAL VERTICAL ACCURACY ASSESSMENT (SVA)

Table 5.3: Bare Earth Open Terrain QA/QC Analysis, STATE PLANE ALABAMA EAST, NAD83, COE Jackson, Marshall, DeKalb Counties AL				
Point ID	Easting (UTM meters)	Northing (UTM meters)	Elevation (meters)	Dz (meters)
2000	515555.9	1345145	970.877	0.323
2001	551243.5	1348837	1013.011	0.249
2002	584918.3	1370979	1120.143	0.053
2003	553953.8	1378982	989.183	0.167
2004	496272.7	1399447	640.813	0.003
2005	437778.7	1429816	914.603	0.133
2006	529383.6	1456119	1215.095	0.095
2007	605851	1377959	1129.852	0.032
2008	647525.5	1367570	719.064	0.046
2009	606492.6	1407839	1170.496	0.156
2010	639312.3	1503784	1405.681	0.241
2011	628142.1	1444439	1272.25	0
2012	627993	1444825	1269.246	0.094
2013	671402.5	1373679	1222.779	0.079
2014	685955.1	1587458	1523.508	0.008

Table 5.3: Bare Earth Open Terrain QA/QC Analysis, STATE PLANE ALABAMA EAST, NAD83, COE Jackson, Marshall, DeKalb Counties AL				
Point ID	Easting (UTM meters)	Northing (UTM meters)	Elevation (meters)	Dz (meters)
2101	513536.6	1535985	603.127	0.147
2102	581184.5	1497943	617.522	0.022
2103	571579.5	1512093	615.758	0.058
2104	569833.1	1558863	1584.569	0.109
2105	575990.2	1587823	1704.871	0.029
2106	593394.7	1579899	1685.685	0.295
2107	641276.8	1591816	633.509	0.011
2108	679969.2	1618161	677.879	0.029
2200	698830.3	1517629	1553.303	0.413
2201	720821.1	1490165	999.611	0.031
2202	727563.5	1559854	1614.206	0.146

Bare Earth/Open Terrain Land Cover Classification Supplemental Vertical Accuracy (SVA) Tested 0.381 meters supplemental vertical accuracy at the 95th percentile in Bare Earth/Open Terrain. Tested against the DEM. Errors larger than 95th percentile include.

- Point 2200, Easting 698830.318, Northing 1517629.194, Z-Error 0.413

Table 5.4: Brush Lands and Trees QA/QC Analysis, STATE PLANE ALABAMA EAST, NAD83, COE Jackson, Marshall, DeKalb Counties AL				
Point ID	Easting (UTM meters)	Northing (UTM meters)	Elevation (meters)	Dz (meters)
5000	520548.4	1336881	913.93	0.17
5001	549894.8	1358905	1023.427	0.743
5003	433515.4	1413685	752.425	0.455
5004	433518.9	1413709	752.351	0.289
5005	433608.5	1414128	708.15	0.77
5006	527514.6	1466322	1203.343	0.347
5007	527528.9	1466329	1203.537	0.393
5008	595825.8	1399051	1144.794	0.266
5009	643732.7	1522391	1366.927	0.383
5010	643724.2	1522402	1366.635	0.345
5013	631595.7	1472220	1290.541	0.659
5014	631588.8	1472237	1289.037	0.523
5015	667844.7	1445725	1265.196	0.244
5016	668749.6	1402549	856.264	0.476
5017	668752.7	1402561	856.778	0.032

Table 5.4: Brush Lands and Trees QA/QC Analysis, STATE PLANE ALABAMA EAST, NAD83, COE Jackson, Marshall, DeKalb Counties AL				
Point ID	Easting (UTM meters)	Northing (UTM meters)	Elevation (meters)	Dz (meters)
5018	713726.9	1608624	1503.9	0.64
5101	510487.6	1544412	618.576	0.744
5103	570179.5	1523086	621.765	0.315
5105	578434.6	1598197	1763.421	0.379
5106	591242.3	1583196	1693.273	0.387
5107	663177.8	1600693	631.306	0.404
5108	663151.9	1631397	669.337	0.363
5200	705434.5	1539493	1449.593	0.597
5201	700437.5	1493156	1486.182	0.098

Brush Lands and Trees Land Cover Classification Supplemental Vertical Accuracy (SVA) Tested 0.763 feet supplemental vertical accuracy at the 95th percentile in Brush Lands and Trees. Tested against the DEM. Brush Lands and Trees Errors larger than 95th percentile include:

- Point 5005, Easting 433608.504, Northing 1414127.54, Z-Error 0.770

Table 5.5: Forested and Fully Grown QA/QC Analysis, STATE PLANE ALABAMA EAST, NAD83, COE Jackson, Marshall, DeKalb Counties AL				
Point ID	Easting (UTM meters)	Northing (UTM meters)	Elevation (meters)	Dz (meters)
6000	530496.2	1561972	625.603	0.427
6001	530331	1561953	624.798	0.362
6002	530218.8	1561935	624.724	0.256
6003	530149	1561917	625.535	0.085
6006	478209.1	1397248	1014.622	0.598
6007	478196.9	1397319	1015.087	0.303
6008	478189.9	1397408	1016.102	0.268
6009	478170.5	1397487	1016.919	0.361
6010	478158.1	1397560	1017.533	0.317
6011	478127.9	1397684	1020.463	0.187
6012	701317.6	1423090	1471.744	0.136
6013	701238.6	1423072	1475.414	0.426
6014	701101.7	1423082	1474.559	0.171
6015	701088.5	1423168	1475.579	0.321
6016	701730.1	1423861	1480.9	0.57
6017	701786.8	1423828	1478.574	0.626
6100	648244.1	1594574	603.486	0.254
6101	648131	1594584	602.414	0.466

Table 5.5: Forested and Fully Grown QA/QC Analysis, STATE PLANE ALABAMA EAST, NAD83, COE Jackson, Marshall, DeKalb Counties AL				
Point ID	Easting (UTM meters)	Northing (UTM meters)	Elevation (meters)	Dz (meters)
6102	648010.6	1594583	601.813	0.187
6103	647909.7	1594594	601.393	0.397
6104	647822.5	1594607	601.491	0.319
6105	647722.8	1594611	601.249	0.541

Forested and Fully Grown Land Cover Classification Supplemental Vertical Accuracy (SVA) Tested 0.621 feet supplemental vertical accuracy at the 95th percentile in Forested and Fully Grown. Tested against the DEM. Forested and Fully Grown Errors larger than 95th percentile include:

- Point 6017, Easting 701786.76, Northing 1423827.679, Z-Error 0.626

Table 5.6: Tall Weeds and Crops QA/QC Analysis, STATE PLANE ALABAMA EAST, NAD83, COE Jackson, Marshall, DeKalb Counties AL				
Point ID	Easting (UTM meters)	Northing (UTM meters)	Elevation (meters)	Dz (meters)
4000	585305.3	1350941	1088.899	0.261
4001	575906.8	1394973	1096.464	0.256
4002	462999.6	1424294	1041.263	0.397
4003	434313.3	1402339	953.13	0.09
4004	541876.3	1489058	695.537	0.793
4005	600925.3	1378472	1119.403	0.063
4006	637848.8	1353353	786.009	0.151
4007	575921.9	1426250	1143.443	0.327
4008	670605.6	1531500	1474.467	0.243
4009	651922	1536469	1432.923	0.517
4010	618907.6	1502236	1414.326	0.344
4011	623550.1	1475043	1273.993	0.317
4012	666922.6	1478458	1390.778	0.138
4013	716386.4	1418629	1291.558	0.152
4014	666920.9	1416908	750.555	0.285
4015	711597.4	1578094	1355.378	0.062
4017	530212.9	1562138	625.809	0.179
4101	541279.9	1610020	682.694	0.246
4102	569087.3	1537225	632.185	0.475
4103	621869.3	1566824	616.171	0.339
4103	629059.4	1621346	629.624	0.466
4104	672245.6	1611452	609.125	0.315

Table 5.6: Tall Weeds and Crops QA/QC Analysis, STATE PLANE ALABAMA EAST, NAD83, COE Jackson, Marshall, DeKalb Counties AL				
Point ID	Easting (UTM meters)	Northing (UTM meters)	Elevation (meters)	Dz (meters)
4200	712373.7	1476342	949.898	0.682
4201	732259.9	1521289	890.558	0.352
4202	689160.6	1558929	1356.153	0.337

Tall Weeds and Crops Land Cover Classification Supplemental Vertical Accuracy (SVA) Tested 0.759 feet supplemental vertical accuracy at the 95th percentile in Tall Weeds and Crops. Tested against the DEM. Tall Weeds and Crops Errors larger than 95th percentile include:

- Point 4004, Easting 541876.324, Northing 1489057.916 Z-Error 0.793

Table 5.7: Urban QA/QC Analysis, STATE PLANE ALABAMA EAST, NAD83, COE Jackson, Marshall, DeKalb Counties AL				
Point ID	Easting (UTM meters)	Northing (UTM meters)	Elevation (meters)	Dz (meters)
3001_90	517605.7	1403080	599.68	0.25
3000	558156.6	1351384	1040.676	0.116
3001	517605.7	1403080	599.609	0.179
3002	541938.7	1370863	1053.654	0.154
3003	438510.3	1442271	1201.392	0.028
3004	454127.1	1391028	1100.388	0.152
3005	611503.5	1377861	1131.643	0.193
3006	647975	1369753	712.685	0.025
3007	630237.6	1495054	1368.357	0.063
3008	609254.2	1485690	1344.784	0.044
3009	609280.1	1485648	1345.545	0.155
3010	652804.3	1454377	1313.122	0.042
3011	673122.1	1505702	1451.771	0.101
3012	675333.8	1505935	1457.448	0.018
3013	696723.8	1443239	915.191	0.261
3101	589281.2	1489485	617.501	0.061
3102	593555.3	1516931	621.421	0.031
3103	542311.7	1539652	1557.142	0.168
3104	572039.9	1573050	1662.025	0.055
3105	594504	1544948	630.848	0.322
3106	581182.2	1608426	1774.495	0.045
3107	647680.6	1596210	625.538	0.012
3107	632969.9	1561671	609.924	0.044

Table 5.7: Urban QA/QC Analysis, STATE PLANE ALABAMA EAST, NAD83, COE Jackson, Marshall, DeKalb Counties AL				
Point ID	Easting (UTM meters)	Northing (UTM meters)	Elevation (meters)	Dz (meters)
3108	688754.5	1620832	666.686	0.114
3109	688861.2	1613567	705.405	0.085
3200	711508.5	1462570	970.452	0.008
3201	735636	1479641	1675.611	0.341

Urban Land Cover Classification Supplemental Vertical Accuracy (SVA) Tested 0.333 feet supplemental vertical accuracy at the 95th percentile in Urban. Tested against the DEM. Urban Errors larger than 95th percentile include:

- Point 3201, Easting 735636.042, Northing 1479641.405 Z-Error 0.341

CONSOLIDATED VERTICAL ACCURACY ASSESMENT (CVA)

Consolidated Vertical Accuracy (CVA) Tested 0.654 feet consolidated vertical accuracy at the 95th percentile level, derived according to ASPRS Guidelines for Vertical Accuracy Reporting for LiDAR Data. Tested against the DEM. Based on the 95th percentile error in all land cover categories combined.

- Point 5013, Easting 631595.727, Northing 1472219.638, Z-Error 0.659
- Point 4200, Easting 712373.733, Northing 1476341.774, Z-Error 0.682
- Point 5001, Easting 549894.769, Northing 1358904.81, Z-Error 0.743
- Point 5101, Easting 510487.559, Northing 1544412.429, Z-Error 0.744
- Point 5005, Easting 433608.504, Northing 1414127.54, Z-Error 0.77
- Point 4004, Easting 541876.324, Northing 541876.324, Z-Error 0.793

Approved By:			
Title	Name	Signature	Date
Associate LiDAR Specialist Certified Photogrammetrist #1281	Qian Xiao		March 2013

SECTION 6: FINAL DELIVERABLES

FINAL DELIVERABLES

The final LiDAR deliverables are listed below:

- LAS v1.2 classified point cloud
- LAS v1.2 raw unclassified point cloud flight line strips no greater than 2GB. Long swaths greater than 2GB will be split into segments.
- Hydrologically flattened Polygon z and Polyline z shapefiles
- Hydrologically flattened bare earth 4-ft DEM in IMG format
- Tile layout and data extent provided as ESRI shapefile
- Control points provided as ESRI shapefile
- FGDC compliant metadata by product in XML format
- LiDAR and Survey processing report in pdf format