WOOLPERT

LiDAR Ground Control Survey Report

USGS OH Chippewa Watershed 2017 B17 LiDAR Project

Task Order Number: G17PD00344

December 2017

LiDAR Ground Control Survey Report

USGS OH Chippewa Watershed 2017 B17 LiDAR Project

Task Order Number: G17PD00344

December 2017

Prepared by Woolpert, Inc.
4454 Idea Center Boulevard
Dayton, OH 45430
Woolpert.com

QUALITY

At Woolpert, quality is the cornerstone of our business. We invite your comments and suggestions for improving this document.

TRADEMARKS

All brand names and product names are trademarks or registered trademarks of their respective companies.

NOTICE OF PROPRIETARY INFORMATION

WOOLPERT

Section 1: LiDAR Ground Control Survey Report

Introduction

This report contains a comprehensive outline of the photogrammetric ground control survey that supported the USGS OH Chippewa Watershed 2017 B17 LiDAR Project. All surveys were performed in compliance with the American Society for Photogrammetry and Remote Sensing (ASPRS) standards required to support new LiDAR data with 0.7 meter average point density, at 1"=100' scale with 6-inch pixel resolution, and the U.S. Geological Survey National Geospatial Program LiDAR Base Specification Version 1.2.

Project Area

The project area includes approximately 188 square miles of the Chippewa Sub-District of the Muskingum Watershed.

Purpose

The purpose of this survey was to establish three-dimensional coordinates for one hundred three (101) new LiDAR control stations and two hundred ten (206) new LiDAR quality control stations. LiDAR quality control stations will be used as quality control for eventual LiDAR data with 0.7 meter average point density, at 1"=100' scale with 6-inch pixel resolution. Specifications for these point densities are outlined in the ASPRS Positional Accuracy Standards for Digital Geospatial Data (Edition 1, Version 1.0, November 2014).

Date of Survey

Ground control field operations took place in April of 2017.

Monumentation

Woolpert field crews performed a field reconnaissance to verify the existence and suitability of preselected 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 LiDAR quality control stations.

Recovery information sheets and photographs for the newly established photogrammetric control stations can be found in Section 4. A control diagram showing the ground control stations used to support this LiDAR mapping project can be found in Section 5 of this report. LiDAR quality control station information sheets and photographs were not documented.

Methodology

Real-Time Kinematic (RTK) GPS

For this particular field effort, Woolpert field crews utilized Woolpert-owned, Trimble Navigation R series multi-frequency GPS receivers. Field personnel generated RTK vectors through the use of Sierra Wireless Raven XT Code Division Multiple Access (CDMA) modems and Trimble Navigation Continually Operating Reference Stations (CORS)

Whenever possible, RTK observations were performed on all new LiDAR control points in order to collect data efficiently and accurately. The survey was conducted using a 1-second epoch rate, in a fixed solution RTK mode, with each observation lasting approximately 180 seconds. Each station was occupied twice to ensure the necessary horizontal and vertical accuracies were being met for this project. RTK surveys were performed where cellular data coverage was available and where baseline distance accuracy was maintained.

Static GPS

Due to the usage of multiple RTK base stations, base stations with accompanying measurements were not contiguous. These stations were linked together via concurrent static observations, allowing for one contiguous network. CORS were also incorporated into the dataset to strengthen the overall baseline network. Data from observation sessions typically lasted several hours, with each session utilizing a 5-second sync rate. Static GPS was also utilized in areas in which cellular data coverage was limited.

Post-Processing and Adjustments

All static GPS observations were processed using Trimble Navigation's Trimble Business Center (TBC) 3.82 baseline processor with precise ephemeris. Both unconstrained and constrained adjustments were computed using trivial and nontrivial baselines. After an acceptable unconstrained least-squares adjustment was obtained, Woolpert performed a fully constrained least-squares adjustment by fixing the GPS network to existing NGS control stations with known coordinate data. Fixed solutions were obtained for all vector baselines.

During this project, the following stations were recovered during the survey:

3-D STATIONS	
Description	**PID**
E 281	KY1826

2-D STATIONS	
Description	**PID**
OHWY	ODOT CORS

1-D STATIONS	
Description	**PID**
CHIP RM 2	KY1840

3-D STATION CHECKS	
Description	**PID**
CHIP	KY1839
M 176	MB1317
N 177	KY1710
R 176	MB1307

2-D STATION CHECKS	
Description	**PID**
OHZP	ODOT CORS

1-D STATION CHECKS	
Description	**PID**
N 287	KY1900

Datum Reference and Final Coordinates

All new horizontal GPS control was based on the Ohio State Plane Coordinate System, North (3401) Zone, North American Datum 1983, HARN adjustment, expressed in U.S. Survey feet. All vertical control was based on the North American Vertical Datum of 1988 (NAVD88) with GEOID12B applied to model the elevations, also expressed in meters. The coordinates for the ground control survey can be found in Section 2 of this report.

Accuracy Statement

The GPS adjustment indicates that the survey control network meets or exceeds the standards set forth by ASPRS in support of LiDAR data with 0.7 meter average point density, at 1”=100’ scale with 6-inch pixel resolution.

WOOLPERT

Section 2: Ground Control Station Coordinate Listings

This section includes a complete listing of the final coordinates, orthometric heights, and ellipsoid heights for the USGS OH Chippewa Watershed 2017 B17 LiDAR Project.

USGS OH Chippewa Watershed 2017 B17
2017 LiDAR CONTROL

Horizontal Datum: NAD 83 (HARN)
Vertical Datum: NAVD 88
Units: US Survey Feet
State Plane Zone: Ohio North Zone 3401
Geoid Model: Geoid 12B
Coordinate System: Grid
Date: December 2017

LiDAR Control and/or Quality Control Stations:

Station Name	Northing (USFT)	Easting (USFT)	Elevation (USFT)	Station Description
1001	527010.59	2109363.18	1143.75	GRAVEL
1002	518944.61	2121400.66	1109.66	CONCRETE
1003	478103.61	2133332.12	981.85	CONCRETE
1004	489746.60	2145330.86	987.54	CONCRETE
1005	475915.87	2157350.94	975.30	ASPHALT
1006	477199.43	2169147.33	960.75	ASPHALT
1007	470625.73	2181079.85	966.67	DIRT/GRAVEL
1008	466057.21	2192997.28	1017.32	ASPHALT
1009	464599.39	2204933.25	1047.24	ASPHALT
2001	522128.46	2124766.52	1034.60	DIRT
2002	507318.05	2161834.45	1009.36	GRAVEL
2003	495289.94	2178462.81	1133.57	DIRT
2004	475523.51	2189804.04	1257.50	GRAVEL
2005	466607.99	2177308.92	964.39	ASPHALT
2006	450528.19	2178716.38	1109.29	DIRT
2007	429419.89	2172027.16	1061.36	ASPHALT
2008	474759.97	2148640.92	968.24	GRAVEL
2009	476974.63	2161102.28	1110.68	ASPHALT
2010	482974.59	2137006.66	991.81	DIRT
2011	510848.87	2133225.98	1006.62	ASPHALT
2012	455838.13	2131637.98	1145.79	ASPHALT
2013	456004.69	2159033.12	1037.43	GRAVEL

WOOLPERT

LiDAR Control and/or Quality Control Stations:				
Station Name	Northing (USFT)	Easting (USFT)	Elevation (USFT)	Station Description
2014	524993.75	2145209.08	1207.47	ASPHALT
2015	532573.35	2112506.69	1130.85	GRAVEL
2016	443193.35	2153582.78	1173.90	ASPHALT
2017	453916.13	2200379.51	1128.76	GRAVEL
2018	501952.99	2155685.99	1212.54	ASPHALT
2019	500128.38	2126510.56	1164.87	CONCRETE
2020	489135.38	2166912.47	1144.75	GRAVEL
2021	514258.27	2150291.62	1234.46	ASPHALT
2022	496251.81	2142495.80	1008.12	CONCRETE
2023	535834.48	2130950.02	1101.88	CONCRETE
2024	511487.71	2123108.59	1131.20	ASPHALT
2025	468716.41	2201192.60	1168.27	ASPHALT
3001	533246.64	2112995.23	1137.92	FOREST
3002	502312.51	2175587.69	1171.38	FOREST
3003	453944.67	2199809.34	1116.86	FOREST
3004	475998.88	2147105.41	971.50	TALL WEEDS
3005	497933.72	2135079.96	991.74	BRUSH
3006	530128.96	2133291.63	1093.33	BRUSH
3007	429848.32	2175867.96	1012.11	TALL WEEDS
3008	455926.31	2144008.09	1135.76	TALL WEEDS

Woolpert Base Stations, Geodetic Control Stations, and/or Geodetic Control Station Checks:				
Station Name	Northing (USFT)	Easting (USFT)	Elevation (USFT)	PID
CHIP	515058.687	2241248.467	1141.390	KY1839
CHIP RM 2	444653.475	2172255.554	1122.944	KY1840
E 281	471404.650	2167257.356	963.295	KY1826
M 176	505734.404	2110123.605	1131.700	MB1317
N 177	466800.297	2184737.181	957.939	KY1710
N 287	450045.449	2198799.761	1029.310	KY1900
OHWY	420689.399	2135678.218	1089.467	ODOT CORS
OHZP	515058.687	2241248.467	1141.390	ODOT CORS
R 176	490818.811	2127739.774	1014.796	MB1307

WOOLPERT

USGS OH Chippewa Watershed 2017 B17
2017 LiDAR CONTROL

Horizontal Datum: NAD 83 (HARN)
Vertical Datum: NAVD 88
Units: US Survey Feet
State Plane Zone: Ohio North Zone 3401
Geoid Model: Geoid 12B
Coordinate System: Geographic
Date: December 2017

LiDAR Control and/or Quality Control Stations:

Station Name	Latitude	Longitude	Height (USFT)	Station Description
1001	N41°06'43.48601"	W81°59'19.63453"	1033.53	GRAVEL
1002	N41°05'23.06031"	W81°56'43.04013"	999.72	CONCRETE
1003	N40°58'38.73391"	W81°54'10.86499"	872.70	CONCRETE
1004	N41°00'32.93677"	W81°51'33.31167"	878.28	CONCRETE
1005	N40°58'15.37407"	W81°48'57.93551"	866.30	ASPHALT
1006	N40°58'27.11421"	W81°46'24.01250"	851.75	ASPHALT
1007	N40°57'21.14862"	W81°43'49.20368"	857.77	DIRT/GRAVEL
1008	N40°56'34.93938"	W81°41'14.43372"	908.48	ASPHALT
1009	N40°56'19.40673"	W81°38'39.08461"	938.38	ASPHALT
2001	N41°05'54.30563"	W81°55'58.81125"	924.60	DIRT
2002	N41°03'25.30368"	W81°47'56.19531"	899.87	GRAVEL
2003	N41°01'25.07903"	W81°44'20.50792"	1024.34	DIRT
2004	N40°58'08.76651"	W81°41'54.91099"	1148.57	GRAVEL
2005	N40°56'41.77558"	W81°44'38.80590"	855.54	ASPHALT
2006	N40°54'02.77086"	W81°44'22.29197"	1000.66	DIRT
2007	N40°50'34.76617"	W81°45'51.72203"	952.91	ASPHALT
2008	N40°58'04.61190"	W81°50'51.59710"	859.22	GRAVEL
2009	N40°58'25.54203"	W81°48'08.92069"	1001.68	ASPHALT
2010	N40°59'26.61279"	W81°53'22.51217"	882.60	DIRT
2011	N41°04'02.29548"	W81°54'09.32441"	896.92	ASPHALT
2012	N40°54'58.84110"	W81°54'34.91792"	1037.02	ASPHALT
2013	N40°54'58.50091"	W81°48'38.05770"	928.72	GRAVEL
2014	N41°06'21.21782"	W81°51'31.51968"	1097.55	ASPHALT
2015	N41°07'38.26670"	W81°58'38.13021"	1020.53	GRAVEL
2016	N40°52'52.33081"	W81°49'50.33336"	1065.33	ASPHALT
2017	N40°54'34.28406"	W81°39'39.75894"	1020.03	GRAVEL
2018	N41°02'32.77293"	W81°49'16.99948"	1103.14	ASPHALT
2019	N41°02'16.81239"	W81°55'37.91814"	1055.32	CONCRETE
2020	N41°00'25.23507"	W81°46'51.86595"	1035.58	GRAVEL

WOOLPERT

LiDAR Control and/or Quality Control Stations:

Station Name	Latitude	Longitude	Height (USFT)	Station Description
2021	N41°04'34.76825"	W81°50'26.18553"	1124.82	ASPHALT
2022	N41°01'37.41854"	W81°52'09.67904"	898.74	CONCRETE
2023	N41°08'09.32695"	W81°54'36.83275"	991.60	CONCRETE
2024	N41°04'09.27153"	W81°56'21.36052"	1021.43	ASPHALT
2025	N40°57'00.44616"	W81°39'27.30709"	1059.40	ASPHALT
3001	N41°07'44.89037"	W81°58'31.69320"	1027.59	FOREST
3002	N41°02'34.71383"	W81°44'57.23041"	1062.03	FOREST
3003	N40°54'34.62026"	W81°39'47.18145"	1008.14	FOREST
3004	N40°58'16.96665"	W81°51'11.49421"	862.45	TALL WEEDS
3005	N41°01'54.55592"	W81°53'46.28686"	882.28	BRUSH
3006	N41°07'12.79441"	W81°54'06.74101"	983.21	BRUSH
3007	N40°50'38.67634"	W81°45'01.70042"	903.65	TALL WEEDS
3008	N40°54'58.85373"	W81°51'53.77846"	1027.02	TALL WEEDS

Woopert Base Stations, Geodetic Control Stations, and/or Geodetic Control Station Checks:

Station Name	Latitude	Longitude	Height (USFT)	PID
CHIP	N40°53'05.52079"	W81°45'47.09857"	1013.971	KY1839
CHIP RM 2	N40°53'05.27086"	W81°45'47.07549"	1014.375	KY1840
E 281	N40°57'30.01126"	W81°46'49.27577"	854.378	KY1826
M 176	N41°03'13.21372"	W81°59'11.33648"	1021.927	MB1317
N 177	N40°56'43.02828"	W81°43'01.98349"	849.090	KY1710
N 287	N40°53'56.18794"	W81°40'00.81558"	920.624	KY1900
OHWY	N40°49'11.25747"	W81°53'45.46131"	980.987	ODOT CORS
OHZP	N41°04'34.18201"	W81°30'38.44769"	1031.703	ODOT CORS
R 176	N41°00'44.74481"	W81°55'22.68083"	905.405	MB1307

WOOLPERT

Section 3: Existing NGS Control Information Sheets

This section contains the published National Geodetic Survey (NGS) Datasheets used or referenced in the final control network for the USGS OH Chippewa Watershed 2017 B17 LiDAR Project. Trimble CORS have not been documented.

The NGS Data Sheet

See file dsdata.pdf for more information about the datasheet.

```
PROGRAM = datasheet95, VERSION = 8.12.1
1        National Geodetic Survey,   Retrieval Date = APRIL 17, 2017
KY1839 ***********************************************************************
KY1839  DESIGNATION -  CHIP
KY1839  PID         -  KY1839
KY1839  STATE/COUNTY-  OH/WAYNE
KY1839  COUNTRY     -  US
KY1839  USGS QUAD   -  RITTMAN (1994)
KY1839
KY1839                        *CURRENT SURVEY CONTROL
KY1839  ______________________________________________________________________
KY1839* NAD 83(2011) POSITION- 40 53 05.52073(N) 081 45 47.09847(W)   ADJUSTED
KY1839* NAD 83(2011) ELLIP HT-   309.064 (meters)        (06/27/12)   ADJUSTED
KY1839* NAD 83(2011) EPOCH    -  2010.00
KY1839* NAVD 88 ORTHO HEIGHT -   342.153 (meters)     1122.55  (feet) ADJUSTED
KY1839  ______________________________________________________________________
KY1839  GEOID HEIGHT    -        -33.092 (meters)                     GEOID12B
KY1839  NAD 83(2011) X  -    691,863.731 (meters)                     COMP
KY1839  NAD 83(2011) Y  - -4,779,385.800 (meters)                     COMP
KY1839  NAD 83(2011) Z  -  4,152,967.466 (meters)                     COMP
KY1839  LAPLACE CORR    -          0.17  (seconds)                    DEFLEC12B
KY1839  DYNAMIC HEIGHT  -        342.002 (meters)     1122.05  (feet) COMP
KY1839  MODELED GRAVITY -    980,173.5   (mgal)                       NAVD 88
KY1839
KY1839  VERT ORDER      -  SECOND    CLASS 0
KY1839
KY1839  Network accuracy estimates per FGDC Geospatial Positioning Accuracy
KY1839  Standards:
KY1839         FGDC (95% conf, cm)     Standard deviation (cm)     CorrNE
KY1839            Horiz  Ellip          SD_N   SD_E   SD_h      (unitless)
KY1839  ------------------------------------------------------------------
KY1839  NETWORK    1.30   1.86          0.64   0.31   0.95      0.14335370
KY1839  ------------------------------------------------------------------
KY1839  Click here for local accuracies and other accuracy information.
KY1839
KY1839
KY1839.The horizontal coordinates were established by GPS observations
KY1839.and adjusted by the National Geodetic Survey in June 2012.
KY1839
KY1839.NAD 83(2011) refers to NAD 83 coordinates where the reference frame has
```

KY1839.been affixed to the stable North American tectonic plate. See
KY1839.NA2011 for more information.
KY1839
KY1839.The horizontal coordinates are valid at the epoch date displayed above
KY1839.which is a decimal equivalence of Year/Month/Day.
KY1839
KY1839.The orthometric height was determined by differential leveling and
KY1839.adjusted by the NATIONAL GEODETIC SURVEY
KY1839.in June 1991.
KY1839
KY1839.Significant digits in the geoid height do not necessarily reflect accuracy.
KY1839.GEOID12B height accuracy estimate available here.
KY1839
KY1839.Photographs are available for this station.
KY1839
KY1839.The X, Y, and Z were computed from the position and the ellipsoidal ht.
KY1839
KY1839.The Laplace correction was computed from DEFLEC12B derived deflections.
KY1839
KY1839.The ellipsoidal height was determined by GPS observations
KY1839.and is referenced to NAD 83.
KY1839
KY1839.The dynamic height is computed by dividing the NAVD 88
KY1839.geopotential number by the normal gravity value computed on the
KY1839.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
KY1839.degrees latitude (g = 980.6199 gals.).
KY1839
KY1839.The modeled gravity was interpolated from observed gravity values.
KY1839
KY1839. The following values were computed from the NAD 83(2011) position.
KY1839

KY1839;		North	East	Units	Scale Factor	Converg.
KY1839;SPC OH N	-	135,538.353	662,104.214	MT	0.99994421	+0 29 02.8
KY1839;SPC OH N	-	444,678.75	2,172,253.58	sFT	0.99994421	+0 29 02.8
KY1839;UTM 17	-	4,526,256.542	435,711.739	MT	0.99965087	-0 29 58.2

KY1839

KY1839!		Elev Factor	x	Scale Factor	=	Combined Factor
KY1839!SPC OH N	-	0.99995152	x	0.99994421	=	0.99989573
KY1839!UTM 17	-	0.99995152	x	0.99965087	=	0.99960241

KY1839

KY1839:		Primary Azimuth Mark	Grid Az
KY1839:SPC OH N	-	CHIP AZ MK	358 03 07.4
KY1839:UTM 17	-	CHIP AZ MK	359 02 08.4

KY1839
KY1839_U.S. NATIONAL GRID SPATIAL ADDRESS: 17TMF3571126256(NAD 83)
KY1839

KY1839| PID	Reference Object	Distance	Geod. Az |
KY1839|			dddmmss.s |
KY1839| KY1838	CHIP RM 1	7.452 METERS	00404 |
KY1839| KY3464	DALTON MUN STANDPIPE	APPROX.10.7 KM	1535747.7 |
KY1839| KY1840	CHIP RM 2	7.699 METERS	17610 |
KY1839| KY3494	ORRVILLE MUN LT WATER PLT STK	APPROX. 3.8 KM	1830732.8 |
KY1839| KY3493	ORRVILLE MUNICIPAL TANK	APPROX. 4.9 KM	1832141.7 |
KY1839| KY3492	ORRVILLE MILK CO STACK	APPROX. 5.6 KM	1922115.4 |

```
KY1839| KY1836 CHIP AZ MK                                              3583210.2 |
KY1839|-----------------------------------------------------------------------|
KY1839
KY1839                          SUPERSEDED SURVEY CONTROL
KY1839
KY1839  NAD 83(2007)-  40 53 05.52072(N)    081 45 47.09932(W) AD(2002.00) 0
KY1839  ELLIP H (02/10/07)  309.076  (m)                       GP(2002.00)
KY1839  ELLIP H (10/07/05)  309.093  (m)                       GP(       ) 4 1
KY1839  NAD 83(1995)-  40 53 05.52070(N)    081 45 47.09910(W) AD(       ) 1
KY1839  ELLIP H (10/25/00)  309.097  (m)                       GP(       ) 4 1
KY1839  NAD 83(1995)-  40 53 05.51978(N)    081 45 47.09676(W) AD(       ) 3
KY1839  NAD 83(1986)-  40 53 05.52935(N)    081 45 47.10207(W) AD(       ) 3
KY1839  NAD 27      -  40 53 05.32232(N)    081 45 47.62804(W) AD(       ) 3
KY1839  NAVD 88             342.15   (m)         1122.5    (f) LEVELING    3
KY1839  NGVD 29 (??/??/92)  342.386  (m)         1123.31   (f) ADJ UNCH    2 0
KY1839  NGVD 29             342.39   (m)         1123.3    (f) LEVELING    3
KY1839
KY1839.Superseded values are not recommended for survey control.
KY1839
KY1839.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
KY1839.See file dsdata.pdf to determine how the superseded data were derived.
KY1839
KY1839_MARKER: DS = TRIANGULATION STATION DISK
KY1839_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
KY1839_STAMPING: CHIP 1959
KY1839_MARK LOGO: CGS
KY1839_PROJECTION: FLUSH
KY1839_MAGNETIC: N = NO MAGNETIC MATERIAL
KY1839_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
KY1839+STABILITY: SURFACE MOTION
KY1839_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
KY1839+SATELLITE: SATELLITE OBSERVATIONS - December 13, 2014
KY1839
KY1839  HISTORY     - Date     Condition        Report By
KY1839  HISTORY     - 1959     MONUMENTED       CGS
KY1839  HISTORY     - 1959     GOOD             CGS
KY1839  HISTORY     - 1971     GOOD             OHDT
KY1839  HISTORY     - 1971     GOOD             OHDT
KY1839  HISTORY     - 1988     GOOD             OHDT
KY1839  HISTORY     - 19980323 GOOD             GCS
KY1839  HISTORY     - 20141213 GOOD             GEOCAC
KY1839
KY1839                          STATION DESCRIPTION
KY1839
KY1839'DESCRIBED BY COAST AND GEODETIC SURVEY 1959 (WER)
KY1839'THE STATION IS ABOUT 3 MILES NORTH ORRVILLE, 1-1/2 MILES SOUTHWEST OF
KY1839'MARSHALLVILLE, ON THE EAST
KY1839'RIGHT-OF-WAY OF STATE HIGHWAY 94, IN BAUGHMAN TOWNSHIP, IN SECTION
KY1839'7, T-17-N AND R-11-W.
KY1839'
KY1839'TO REACH THE STATION FROM THE INTERSECTION OF MAIN STREET AND MARKET
KY1839'STREET IN ORRVILLE, GO
KY1839'NORTH ON STATE HIGHWAY 94 FOR 3.1 MILES TO THE STATION ON THE RIGHT.
KY1839'
KY1839'STATION MARKS ARE STANDARD DISKS STAMPED CHIP 1959.  THE SURFACE DISK
```

KY1839'IS SET IN A SQUARE CONCRETE POST
KY1839'FLUSH WITH THE SURFACE OF THE GROUND. IT IS 215 FEET NORTHEAST OF
KY1839'THE DRIVEWAY ENTRANCE TO THE HOME OF MR. WILLARD J.
KY1839'YEAKLEY, 28 FEET EAST OF THE CENTER LINE OF HIGHWAY 94, 9 FEET NORTH
KY1839'OF A POWERLINE POLE FOURTH POLE NORTH OF A FARM
KY1839'HOUSE AND 2 FEET WEST OF THE RIGHT-OF-WAY FENCELINE.
KY1839'A STANDARD WITNESS POST WAS SET 3.3 FEET NORTHEAST OF THE
KY1839'MARK. THE UNDERGROUND DISK IS SET IN AN
KY1839'IRREGULAR MASS OF CONCRETE 32 INCHES BELOW THE SURFACE OF THE GROUND.
KY1839'
KY1839'REFERENCE MARK NO. 1, A STANDARD DISK STAMPED CHIP NO 1 1959, IS SET
KY1839'IN A SQUARE CONCRETE POST
KY1839'WHICH PROJECTS 2 INCHES. IT IS 33 FEET NORTH OF THE POWERLINE POLE,
KY1839'29 FEET EAST OF THE CENTER LINE OF
KY1839'HIGHWAY AND 1 FOOT WEST OF THE RIGHT-OF-WAY FENCELINE.
KY1839'
KY1839'REFERENCE MARK NO. 2, A STANDARD DISK STAMPED CHIP NO 2 1959, IS SET
KY1839'IN A SQUARE CONCRETE POST
KY1839'WHICH PROJECTS 2 INCHES. IT IS 190 FEET NORTHEAST OF THE DRIVEWAY,
KY1839'30 FEET EAST OF THE CENTER LINE
KY1839'OF HIGHWAY, 17 FEET SOUTH OF THE POWERLINE POLE AND 1
KY1839'FOOT WEST OF THE RIGHT-OF-WAY FENCELINE.
KY1839'
KY1839'AZIMUTH MARK, A STANDARD DISK STAMPED CHIP 1959, IS SET IN A SQUARE
KY1839'CONCRETE POST WHICH PROJECTS 4
KY1839'INCHES. IT IS 238 FEET SOUTH OF THE CENTERLINE OF A DRIVEWAY
KY1839'ENTRANCE, 40 FEET EAST OF THE
KY1839'CENTERLINE OF HIGHWAY 94 AND 2 FEET SOUTH OF THE POWERLINE POLE
KY1839'WHICH IS THE SIXTH POLE NORTH OF THE
KY1839'JUNCTION OF HIGHWAY 94 AND TOWNSHIP ROAD 221. A
KY1839'STANDARD WITNESS POST WAS SET 1.6 FEET NORTHEAST OF THE
KY1839'MARK.
KY1839'
KY1839'TO REACH THE AZIMUTH MARK FROM THE STATION, GO NORTH ON HIGHWAY 94
KY1839'FOR 0.3 MILE TO THE MARK ON
KY1839'THE LEFT.
KY1839
KY1839   STATION RECOVERY (1959)
KY1839
KY1839'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1959
KY1839'3 MI N FROM ORRVILLE.
KY1839'ABOUT 3.0 MILES NORTH ALONG STATE HIGHWAY 94 FROM THE LIBRARY
KY1839'AT ORRVILLE, 0.25 MILE SOUTH OF THE JUNCTION OF ROAD 221 LEADING
KY1839'EAST, 0.2 MILE SOUTH OF THE JUNCTION OF ROAD 221 LEADING WEST,
KY1839'50 YARDS NORTH OF THE TOP OF GRADE, 27 1/2 FEET EAST OF THE
KY1839'CENTER LINE OF HIGHWAY 94, 2 1/2 FEET WEST OF A WIRE FENCE, 8 1/2
KY1839'FEET NORTH OF A POWER LINE POLE, 25.2 FEET NORTH OF R M 2, 24.4
KY1839'FEET SOUTH OF R M 1, 3.3 FEET SOUTHWEST OF A STEEL WITNESS
KY1839'POST, AND ABOUT 3 FEET ABOVE THE LEVEL OF THE HIGHWAY, AND SET
KY1839'IN TOP OF A CONCRETE POST FLUSH WITH THE GROUND.
KY1839
KY1839   STATION RECOVERY (1971)
KY1839
KY1839'RECOVERY NOTE BY OHIO DEPARTMENT OF TRANSPORTATION 1971 (WHC)
KY1839'CHIP, CHIP R.M. NO. 1 AND R.M. NO. 2 RECOVERED GOOD.

```
KY1839'
KY1839'CHIP AZI RECOVERED GOOD.
KY1839'
KY1839'DISTANCE AND DIRECTION FROM NEAREST TOWN--ABOUT 3 MILES NORTH ALONG
KY1839'SR 57 FROM LIBRARY AT ORRVILLE.
KY1839
KY1839                          STATION RECOVERY (1971)
KY1839
KY1839'RECOVERY NOTE BY OHIO DEPARTMENT OF TRANSPORTATION 1971 (RS)
KY1839'CHIP 1959 RECOVERED GOOD - HAS WITNESS.
KY1839'
KY1839'CHIP NO. 1-1959 RECOVERED GOOD - NO WITNESS.
KY1839'
KY1839'CHIP NO. 2-1959 RECOVERED GOOD - NO WITNESS.
KY1839'
KY1839'AZI. CHIP-1959 RECOVERED GOOD - HAS WITNESS.
KY1839'
KY1839'DESCRIPTION IS ACCURATE EXCEPT ROUTE 94 IS NOW ROUTE 57.
KY1839'
KY1839'DISTANCE AND DIRECTION FROM NEAREST TOWN--3 MILES + OR - NORTH OF
KY1839'ORRVILLE.
KY1839
KY1839                          STATION RECOVERY (1988)
KY1839
KY1839'RECOVERY NOTE BY OHIO DEPARTMENT OF TRANSPORTATION 1988 (ROS)
KY1839'RECOVERED IN GOOD CONDITION.
KY1839
KY1839                          STATION RECOVERY (1998)
KY1839
KY1839'RECOVERY NOTE BY GEODETIC CONSULTING SERVICES 1998 (KDZ)
KY1839'RECOVERED AS DESCRIBED.
KY1839
KY1839                          STATION RECOVERY (2014)
KY1839
KY1839'RECOVERY NOTE BY GEOCACHING 2014 (RLM)
KY1839'THE STATION MARK, REFERENCE MARKS 1 AND 2 AND THE AZIMUTH MARK WERE
KY1839'ALL RECOVERED IN GOOD CONDITION.  THE FENCE HAS BEEN REMOVED.

*** retrieval complete.
Elapsed Time = 00:00:02
```

The NGS Data Sheet

See file dsdata.pdf for more information about the datasheet.

```
PROGRAM = datasheet95, VERSION = 8.12.1
1        National Geodetic Survey,   Retrieval Date = APRIL 17, 2017
KY1840 ***********************************************************************
KY1840  DESIGNATION -  CHIP RM 2
KY1840  PID         -  KY1840
KY1840  STATE/COUNTY-  OH/WAYNE
KY1840  COUNTRY     -  US
KY1840  USGS QUAD   -  RITTMAN (1994)
KY1840
KY1840                        *CURRENT SURVEY CONTROL
KY1840  ______________________________________________________________________
KY1840* NAD 83(1986) POSITION- 40 53 05.27   (N) 081 45 47.08   (W)    HD_HELD1
KY1840* NAVD 88 ORTHO HEIGHT -   342.274 (meters)     1122.94  (feet) ADJUSTED
KY1840  ______________________________________________________________________
KY1840  GEOID HEIGHT    -        -33.092 (meters)                     GEOID12B
KY1840  DYNAMIC HEIGHT  -        342.123 (meters)     1122.45  (feet) COMP
KY1840  MODELED GRAVITY -    980,173.5   (mgal)                       NAVD 88
KY1840
KY1840  VERT ORDER      -  SECOND    CLASS 0
KY1840
KY1840.The horizontal coordinates were determined by differentially corrected
KY1840.hand held GPS observations or other comparable positioning techniques
KY1840.and have an estimated accuracy of +/- 3 meters.
KY1840.
KY1840.The orthometric height was determined by differential leveling and
KY1840.adjusted by the NATIONAL GEODETIC SURVEY
KY1840.in June 1991.
KY1840
KY1840.Significant digits in the geoid height do not necessarily reflect accuracy.
KY1840.GEOID12B height accuracy estimate available here.
KY1840
KY1840.Photographs are available for this station.
KY1840
KY1840.The dynamic height is computed by dividing the NAVD 88
KY1840.geopotential number by the normal gravity value computed on the
KY1840.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
KY1840.degrees latitude (g = 980.6199 gals.).
KY1840
KY1840.The modeled gravity was interpolated from observed gravity values.
KY1840
KY1840;                    North         East     Units  Estimated Accuracy
KY1840;SPC OH N     -   135,530.6     662,104.7     MT  (+/- 3 meters HH1 GPS)
KY1840
KY1840_U.S. NATIONAL GRID SPATIAL ADDRESS: 17TMF3571226248(NAD 83)
KY1840
KY1840                           SUPERSEDED SURVEY CONTROL
KY1840
KY1840  NGVD 29 (??/??/92)  342.507  (m)         1123.71   (f) ADJ UNCH    2 0
KY1840
KY1840.Superseded values are not recommended for survey control.
```

```
KY1840
KY1840.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
KY1840.See file dsdata.pdf to determine how the superseded data were derived.
KY1840
KY1840_MARKER: DR = REFERENCE MARK DISK
KY1840_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
KY1840_STAMPING: CHIP NO 2 1959
KY1840_MARK LOGO: CGS
KY1840_PROJECTION: PROJECTING 10 CENTIMETERS
KY1840_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
KY1840+STABILITY: SURFACE MOTION
KY1840_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
KY1840+SATELLITE: SATELLITE OBSERVATIONS - December 13, 2014
KY1840
KY1840  HISTORY     - Date     Condition        Report By
KY1840  HISTORY     - 1959     MONUMENTED       CGS
KY1840  HISTORY     - 20141213 GOOD             GEOCAC
KY1840
KY1840                          STATION DESCRIPTION
KY1840
KY1840'DESCRIBED BY COAST AND GEODETIC SURVEY 1959
KY1840'3 MI N FROM ORRVILLE.
KY1840'ABOUT 3.0 MILES NORTH ALONG STATE HIGHWAY 94 FROM THE LIBRARY
KY1840'AT ORRVILLE, 29 1/2 FEET EAST OF THE CENTER LINE OF THE HIGHWAY,
KY1840'1 FOOT WEST OF A WIRE FENCE, 16 1/2 FEET SOUTH OF A POWER LINE
KY1840'POLE, 25.2 FEET SOUTH OF STATION CHIP, 49.6 FEET SOUTH OF R M 1,
KY1840'ABOUT 2 FEET ABOVE THE LEVEL OF THE HIGHWAY, AND SET IN TOP
KY1840'OF A CONCRETE POST PROJECTING 4 INCHES.
KY1840
KY1840                          STATION RECOVERY (2014)
KY1840
KY1840'RECOVERY NOTE BY GEOCACHING 2014 (RLM)
KY1840'RECOVERED IN GOOD CONDITION.  THE FENCE HAS BEEN REMOVED.  THE MARK IS
KY1840'1 FT (0.3 M) WEST OF A CARSONITE WITNESS POST.

*** retrieval complete.
Elapsed Time = 00:00:01
```

The NGS Data Sheet

See file dsdata.pdf for more information about the datasheet.

```
PROGRAM = datasheet95, VERSION = 8.12.1
1        National Geodetic Survey,   Retrieval Date = APRIL 17, 2017
KY1826 ***********************************************************************
KY1826  DESIGNATION -  E 281
KY1826  PID         -  KY1826
KY1826  STATE/COUNTY-  OH/WAYNE
KY1826  COUNTRY     -  US
KY1826  USGS QUAD   -  RITTMAN (1994)
KY1826
KY1826                         *CURRENT SURVEY CONTROL
KY1826  ______________________________________________________________________
KY1826* NAD 83(2011) POSITION- 40 57 30.01126(N) 081 46 49.27577(W)   ADJUSTED
KY1826* NAD 83(2011) ELLIP HT-   260.413 (meters)        (06/27/12)   ADJUSTED
KY1826* NAD 83(2011) EPOCH   -  2010.00
KY1826* NAVD 88 ORTHO HEIGHT -   293.613 (meters)      963.30   (feet) ADJUSTED
KY1826  ______________________________________________________________________
KY1826  GEOID HEIGHT    -        -33.198 (meters)                     GEOID12B
KY1826  NAD 83(2011) X  -    689,653.621 (meters)                     COMP
KY1826  NAD 83(2011) Y  - -4,774,268.084 (meters)                     COMP
KY1826  NAD 83(2011) Z  -  4,159,100.848 (meters)                     COMP
KY1826  LAPLACE CORR    -          0.16  (seconds)                    DEFLEC12B
KY1826  DYNAMIC HEIGHT  -        293.485 (meters)      962.88   (feet) COMP
KY1826  MODELED GRAVITY -    980,179.5   (mgal)                       NAVD 88
KY1826
KY1826  VERT ORDER      -  SECOND    CLASS 0
KY1826
KY1826  Network accuracy estimates per FGDC Geospatial Positioning Accuracy
KY1826  Standards:
KY1826         FGDC (95% conf, cm)     Standard deviation (cm)     CorrNE
KY1826            Horiz  Ellip           SD_N   SD_E   SD_h      (unitless)
KY1826  ------------------------------------------------------------------
KY1826  NETWORK    1.43   2.08           0.70   0.34   1.06      0.14510857
KY1826  ------------------------------------------------------------------
KY1826  Click here for local accuracies and other accuracy information.
KY1826
KY1826
KY1826.The horizontal coordinates were established by GPS observations
KY1826.and adjusted by the National Geodetic Survey in June 2012.
KY1826
KY1826.NAD 83(2011) refers to NAD 83 coordinates where the reference frame has
KY1826.been affixed to the stable North American tectonic plate. See
KY1826.NA2011 for more information.
KY1826
KY1826.The horizontal coordinates are valid at the epoch date displayed above
KY1826.which is a decimal equivalence of Year/Month/Day.
KY1826
KY1826.The orthometric height was determined by differential leveling and
KY1826.adjusted by the NATIONAL GEODETIC SURVEY
KY1826.in June 1991.
KY1826
```

```
KY1826.Significant digits in the geoid height do not necessarily reflect accuracy.
KY1826.GEOID12B height accuracy estimate available here.
KY1826
KY1826.The X, Y, and Z were computed from the position and the ellipsoidal ht.
KY1826
KY1826.The Laplace correction was computed from DEFLEC12B derived deflections.
KY1826
KY1826.The ellipsoidal height was determined by GPS observations
KY1826.and is referenced to NAD 83.
KY1826
KY1826.The dynamic height is computed by dividing the NAVD 88
KY1826.geopotential number by the normal gravity value computed on the
KY1826.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
KY1826.degrees latitude (g = 980.6199 gals.).
KY1826
KY1826.The modeled gravity was interpolated from observed gravity values.
KY1826
KY1826. The following values were computed from the NAD 83(2011) position.
KY1826
KY1826;                    North         East     Units Scale Factor Converg.
KY1826;SPC OH N     -   143,684.425   660,581.363   MT  0.99994095   +0 28 22.0
KY1826;SPC OH N     -   471,404.65  2,167,257.36   sFT  0.99994095   +0 28 22.0
KY1826;UTM  17      - 4,534,425.190   434,329.403   MT  0.99965308   -0 30 41.6
KY1826
KY1826!             -  Elev Factor  x  Scale Factor =   Combined Factor
KY1826!SPC OH N     -   0.99995915  x   0.99994095  =   0.99990011
KY1826!UTM  17      -   0.99995915  x   0.99965308  =   0.99961225
KY1826
KY1826_U.S. NATIONAL GRID SPATIAL ADDRESS: 17TMF3432934425(NAD 83)
KY1826
KY1826                           SUPERSEDED SURVEY CONTROL
KY1826
KY1826  NAD 83(2007)-  40 57 30.01127(N)    081 46 49.27661(W) AD(2002.00) 0
KY1826  ELLIP H (02/10/07)  260.426  (m)                       GP(2002.00)
KY1826  ELLIP H (10/07/05)  260.446  (m)                       GP(       ) 4 1
KY1826  NAD 83(1995)-  40 57 30.01123(N)    081 46 49.27642(W) AD(       ) 1
KY1826  ELLIP H (10/25/00)  260.441  (m)                       GP(       ) 4 1
KY1826  NAVD 88             293.61   (m)          963.3    (f) LEVELING    3
KY1826  NGVD 29 (??/??/92)  293.874  (m)          964.15   (f) ADJ UNCH    2 0
KY1826
KY1826.Superseded values are not recommended for survey control.
KY1826
KY1826.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
KY1826.See file dsdata.pdf to determine how the superseded data were derived.
KY1826
KY1826_MARKER: DB = BENCH MARK DISK
KY1826_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
KY1826_STAMPING: E 281 1959
KY1826_MARK LOGO: CGS
KY1826_MAGNETIC: N = NO MAGNETIC MATERIAL
KY1826_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
KY1826+STABILITY: SURFACE MOTION
KY1826_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
KY1826+SATELLITE: SATELLITE OBSERVATIONS - May 17, 2014
KY1826
```

```
KY1826  HISTORY     - Date     Condition        Report By
KY1826  HISTORY     - 1959     MONUMENTED       CGS
KY1826  HISTORY     - 1971     GOOD             OHDT
KY1826  HISTORY     - 1987     GOOD             OHDT
KY1826  HISTORY     - 19980323 GOOD             GCS
KY1826  HISTORY     - 20111028 GOOD             GEOCAC
KY1826  HISTORY     - 20140517 GOOD             FAMM
KY1826
KY1826                          STATION DESCRIPTION
KY1826
KY1826'DESCRIBED BY COAST AND GEODETIC SURVEY 1959
KY1826'0.6 MI S FROM RITTMAN.
KY1826'ABOUT 0.65 MILE SOUTH ALONG STATE HIGHWAY 94 FROM THE BALTIMORE
KY1826'AND OHIO RAILROAD STATION AT RITTMAN, 0.25 MILE SOUTH OF THE
KY1826'SOUTH ONE OF TWO CONCRETE BRIDGES, 31 FEET EAST OF THE CENTER
KY1826'LINE OF THE HIGHWAY AND AT THE OUTSIDE OF A CURVE WITH TANGENTS
KY1826'EXTENDING NORTHEAST AND SOUTH, 94 FEET NORTH OF THE NORTH END OF
KY1826'EAST CONCRETE HEAD WALL OF A 24-INCH PIPE CULVERT, 20 1/2 FEET
KY1826'SOUTH OF A FENCE CORNER, 2 FEET WEST OF A WIRE FENCE, 23 FEET
KY1826'SOUTH OF A TELEPHONE POLE, ABOUT 1 1/2 FEET ABOVE THE LEVEL OF
KY1826'THE HIGHWAY, AND SET IN TOP OF A CONCRETE POST PROJECTING 3 INCHES.
KY1826
KY1826                          STATION RECOVERY (1971)
KY1826
KY1826'RECOVERY NOTE BY OHIO DEPARTMENT OF TRANSPORTATION 1971
KY1826'RECOVERED IN GOOD CONDITION.
KY1826
KY1826                          STATION RECOVERY (1987)
KY1826
KY1826'RECOVERY NOTE BY OHIO DEPARTMENT OF TRANSPORTATION 1987 (ROS)
KY1826'RECOVERED IN GOOD CONDITION.
KY1826
KY1826                          STATION RECOVERY (1998)
KY1826
KY1826'RECOVERY NOTE BY GEODETIC CONSULTING SERVICES 1998 (KDZ)
KY1826'RECOVERED AS DESCRIBED.
KY1826
KY1826                          STATION RECOVERY (2011)
KY1826
KY1826'RECOVERY NOTE BY GEOCACHING 2011 (RLM)
KY1826'RECOVERED IN GOOD CONDITION. REPLACE REFERENCE TO STATE HIGHWAY 94
KY1826'WITH SOUTH MAIN STREET.
KY1826'
KY1826
KY1826                          STATION RECOVERY (2014)
KY1826
KY1826'RECOVERY NOTE BY FUGRO AERIAL AND MOBILE MAPPING INC 2014 (MRY)
KY1826'RECOVERED IN GOOD CONDITION.

*** retrieval complete.
Elapsed Time = 00:00:01
```

The NGS Data Sheet

See file dsdata.pdf for more information about the datasheet.

```
PROGRAM = datasheet95, VERSION = 8.12.1
1        National Geodetic Survey,   Retrieval Date = APRIL 22, 2017
MB1317 ***********************************************************************
MB1317  CBN         -  This is a Cooperative Base Network Control Station.
MB1317  DESIGNATION -  M 176
MB1317  PID         -  MB1317
MB1317  STATE/COUNTY-  OH/MEDINA
MB1317  COUNTRY     -  US
MB1317  USGS QUAD   -  WESTFIELD CENTER (1994)
MB1317
MB1317                        *CURRENT SURVEY CONTROL
MB1317  ______________________________________________________________________
MB1317* NAD 83(2011) POSITION- 41 03 13.21066(N) 081 59 11.33477(W)   ADJUSTED
MB1317* NAD 83(2011) ELLIP HT-   311.442 (meters)        (06/27/12)   ADJUSTED
MB1317* NAD 83(2011) EPOCH   -  2010.00
MB1317* NAVD 88 ORTHO HEIGHT -   344.920 (meters)     1131.63  (feet) ADJUSTED
MB1317  ______________________________________________________________________
MB1317  GEOID HEIGHT    -        -33.459 (meters)                    GEOID12B
MB1317  NAD 83(2011) X  -    671,510.191 (meters)                    COMP
MB1317  NAD 83(2011) Y  - -4,769,877.319 (meters)                    COMP
MB1317  NAD 83(2011) Z  -  4,167,124.171 (meters)                    COMP
MB1317  LAPLACE CORR    -          1.86  (seconds)                   DEFLEC12B
MB1317  DYNAMIC HEIGHT  -        344.770 (meters)     1131.13  (feet) COMP
MB1317  MODELED GRAVITY -    980,176.9   (mgal)                      NAVD 88
MB1317
MB1317  VERT ORDER      -  FIRST     CLASS I
MB1317
MB1317  Network accuracy estimates per FGDC Geospatial Positioning Accuracy
MB1317  Standards:
MB1317         FGDC (95% conf, cm)     Standard deviation (cm)     CorrNE
MB1317            Horiz  Ellip           SD_N   SD_E   SD_h      (unitless)
MB1317  ------------------------------------------------------------------
MB1317  NETWORK    0.88   1.43           0.41   0.28   0.73      0.02029262
MB1317  ------------------------------------------------------------------
MB1317  Click here for local accuracies and other accuracy information.
MB1317
MB1317
MB1317.The horizontal coordinates were established by GPS observations
MB1317.and adjusted by the National Geodetic Survey in June 2012.
MB1317
MB1317.NAD 83(2011) refers to NAD 83 coordinates where the reference frame has
MB1317.been affixed to the stable North American tectonic plate. See
MB1317.NA2011 for more information.
MB1317
MB1317.The horizontal coordinates are valid at the epoch date displayed above
MB1317.which is a decimal equivalence of Year/Month/Day.
MB1317
MB1317.The orthometric height was determined by differential leveling and
MB1317.adjusted by the NATIONAL GEODETIC SURVEY
MB1317.in June 1991.
```

```
MB1317
MB1317.Significant digits in the geoid height do not necessarily reflect accuracy.
MB1317.GEOID12B height accuracy estimate available here.
MB1317
MB1317.Photographs are available for this station.
MB1317
MB1317.The X, Y, and Z were computed from the position and the ellipsoidal ht.
MB1317
MB1317.The Laplace correction was computed from DEFLEC12B derived deflections.
MB1317
MB1317.The ellipsoidal height was determined by GPS observations
MB1317.and is referenced to NAD 83.
MB1317
MB1317.The dynamic height is computed by dividing the NAVD 88
MB1317.geopotential number by the normal gravity value computed on the
MB1317.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
MB1317.degrees latitude (g = 980.6199 gals.).
MB1317
MB1317.The modeled gravity was interpolated from observed gravity values.
MB1317
MB1317. The following values were computed from the NAD 83(2011) position.
MB1317
MB1317;                    North         East     Units Scale Factor Converg.
MB1317;SPC OH N     -   154,148.060   643,167.002   MT  0.99993917   +0 20 14.5
MB1317;SPC OH N     -   505,734.09  2,110,123.74   sFT  0.99993917   +0 20 14.5
MB1317;UTM  17      - 4,545,183.647   417,102.126   MT  0.99968458   -0 38 52.5
MB1317
MB1317!             -  Elev Factor  x  Scale Factor =   Combined Factor
MB1317!SPC OH N     -   0.99995115  x   0.99993917  =   0.99989032
MB1317!UTM  17      -   0.99995115  x   0.99968458  =   0.99963575
MB1317
MB1317_U.S. NATIONAL GRID SPATIAL ADDRESS: 17TMF1710245183(NAD 83)
MB1317
MB1317                           SUPERSEDED SURVEY CONTROL
MB1317
MB1317  NAD 83(2007)-  41 03 13.21058(N)    081 59 11.33556(W) AD(2002.00) 0
MB1317  ELLIP H (02/10/07)  311.458  (m)                       GP(2002.00)
MB1317  ELLIP H (03/08/05)  311.477  (m)                       GP(       ) 4 2
MB1317  NAD 83(1995)-  41 03 13.21094(N)    081 59 11.33577(W) AD(       ) B
MB1317  ELLIP H (08/20/96)  311.471  (m)                       GP(       ) 4 2
MB1317  NAD 83(1986)-  41 03 13.21405(N)    081 59 11.33673(W) AD(       ) 3
MB1317  NAD 27      -  41 03 13.01910(N)    081 59 11.83876(W) AD(       ) 3
MB1317  NAVD 88 (08/20/96)  344.9    (m)  GEOID93 model used   GPS OBS
MB1317  NGVD 29 (??/??/92)  345.138  (m)         1132.34   (f) ADJ UNCH    1 1
MB1317  NGVD 29 (02/23/89)  345.     (m)  RAPSU86 model used   GPS OBS
MB1317
MB1317.Superseded values are not recommended for survey control.
MB1317
MB1317.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
MB1317.See file dsdata.pdf to determine how the superseded data were derived.
MB1317
MB1317_MARKER: DB = BENCH MARK DISK
MB1317_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
MB1317_STAMPING: M 176 1954
MB1317_MARK LOGO: CGS
```

```
MB1317_PROJECTION: RECESSED 18 CENTIMETERS
MB1317_MAGNETIC: N = NO MAGNETIC MATERIAL
MB1317_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
MB1317+STABILITY: SURFACE MOTION
MB1317_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
MB1317+SATELLITE: SATELLITE OBSERVATIONS - June 25, 2016
MB1317
MB1317  HISTORY     - Date     Condition        Report By
MB1317  HISTORY     - 1954     MONUMENTED       CGS
MB1317  HISTORY     - 1967     GOOD             CGS
MB1317  HISTORY     - 1986     GOOD             NGS
MB1317  HISTORY     - 1987     GOOD             USPSQD
MB1317  HISTORY     - 19950724 GOOD             NGS
MB1317  HISTORY     - 19980323 GOOD             GCS
MB1317  HISTORY     - 2000     GOOD             OH-103
MB1317  HISTORY     - 20160625 GOOD             GEOCAC
MB1317
MB1317                          STATION DESCRIPTION
MB1317
MB1317'DESCRIBED BY COAST AND GEODETIC SURVEY 1967
MB1317'1.9 MI NE FROM LODI.
MB1317'ABOUT 1.9 MILES NORTHEAST ALONG STATE HIGHWAY 421 AND U.S.
MB1317'HIGHWAY 42 FROM THE INTERSECTION OF STATE HIGHWAY 76 AT LODI,
MB1317'ABOUT 0.6 MILE NORTHEAST ALONG U.S. HIGHWAY 42 FROM THE NORTHEAST
MB1317'END OF THE U.S. HIGHWAY 224 OVERPASS, NEAR THE NORTHWEST CORNER
MB1317'OF THE LODI AIRPORT, 72 FEET EAST OF THE INTERSECTION OF U.S.
MB1317'HIGHWAY 42 AND TOWNSHIP ROAD NO. 78, 30 FEET SOUTHEAST OF THE
MB1317'CENTER LINE OF THE HIGHWAY, 30 1/2 FEET NORTH OF THE CENTER LINE
MB1317'OF TOWNSHIP ROAD NO. 78, 9 FEET NORTHEAST OF A GAS LINE MARKER
MB1317'NO. RDI 989S, 1.1 FEET NORTHEAST OF A METAL WITNESS POST, 2 FEET
MB1317'BELOW THE LEVEL OF THE HIGHWAY, SET IN THE TOP OF A CONCRETE POST
MB1317'0.2 FOOT UNDERGROUND.
MB1317
MB1317                          STATION RECOVERY (1986)
MB1317
MB1317'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1986
MB1317'STATION IS LOCATED ABOUT 2 MILES NORTHEAST OF LODI, 5 MILES WEST
MB1317'NORTHWEST OF THE JUNCTION OF INTERSTATE HIGHWAYS 76 AND 71, AT A ROAD
MB1317'JUNCTION, ON HIGHWAY RIGHT-OF-WAY.  OWNERSHIP  OHIO DEPARTMENT OF
MB1317'TRANSPORTATION.
MB1317'TO REACH FROM THE JUNCTION OF US HIGHWAYS 42 AND 224 AT THE NORTHWEST
MB1317'EDGE OF LODI, GO NORTHEAST ON HIGHWAY 42 FOR 0.7 MILES TO A SLANTED
MB1317'CROSSROAD AND STATION ON THE RIGHT.
MB1317'STATION MARK IS A STANDARD CGS BENCH MARK DISK STAMPED --M 176 1954--
MB1317'SET IN THE TOP OF A 25 CM SQUARE CONCRETE POST 0.4 METER BELOW GROUND
MB1317'(AREA IS VERY UNEVEN TO DITCHING AND PIPELINE).  IT IS 9.2 METERS
MB1317'SOUTHEAST OF THE CENTER OF HIGHWAY 42, 9.8 METERS NORTH OF THE
MB1317'CENTER OF COUNTY ROUT 78, 5.6 METERS WEST OF UTILITY POLE 65CR/4-12,
MB1317'3.7 METERS EAST OF A UTILITY POLE WITH STEPS, 4.2 METERS NORTHWEST
MB1317'OF THE SOUTHWEST ONE OF TWO PIPELINE WARNING POLES, AND 0.3 METER
MB1317'NORTHEAST OF A METAL WITNESS POLE.
MB1317'DESCRIBED BY G R HEID.
MB1317'TYPED BY JAMES MALONEY 9/09/87.
MB1317
MB1317                          STATION RECOVERY (1987)
```

```
MB1317
MB1317'RECOVERY NOTE BY US POWER SQUADRON 1987 (ROS)
MB1317'RECOVERED IN GOOD CONDITION.
MB1317
MB1317                          STATION RECOVERY (1995)
MB1317
MB1317'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1995 (AJL)
MB1317'THE STATION IS LOCATED ABOUT 3.2 KM (2.00 MI) NORTHEAST OF LODI, 8.0
MB1317'KM (4.95 MI) WEST NORTHWEST OF THE JUNCTION OF INTERSTATE HIGHWAYS 76
MB1317'AND 71, ON HIGHWAY RIGHT-OF-WAY AT THE JUNCTION OF U S HIGHWAY 42 AND
MB1317'KENNARD ROAD.  TO REACH FROM THE JUNCTION OF U S HIGHWAYS 224 AND 42
MB1317'AT THE NORTHEAST EDGE OF LODI, GO NORTHEAST ON HIGHWAY 42 FOR 1.1 KM
MB1317'(0.70 MI) TO KENNARD ROAD AND THE STATION ON THE RIGHT.  THE STATION
MB1317'IS 9.2 M (30.2 FT) SOUTHEAST OF THE CENTER OF HIGHWAY 42, 10.1 M (33.1
MB1317'FT) NORTH OF THE CENTER OF KENNARD ROAD, 5.2 M (17.1 FT) NORTH OF A
MB1317'STOP SIGN, 5.6 M (18.4 FT) WEST OF UTILITY POLE NUMBER 65CR/4-12, 3.7
MB1317'M (12.1 FT) EAST OF ANOTHER UTILITY POLE, 0.6 M (2.0 FT) SOUTHEAST OF
MB1317'A FIBERGLASS WITNESS POST, AND RECESSED 0.3 M (1.0 FT) BELOW GROUND.
MB1317
MB1317                          STATION RECOVERY (1998)
MB1317
MB1317'RECOVERY NOTE BY GEODETIC CONSULTING SERVICES 1998 (KDZ)
MB1317'RECOVERED AS DESCRIBED.
MB1317
MB1317                          STATION RECOVERY (2000)
MB1317
MB1317'RECOVERY NOTE BY MEDINA COUNTY OHIO 2000
MB1317'RECOVERY NOTE BY MEDINA COUNTY SANITARY ENGINEER 2001
MB1317'FOUND AS DESCRIBED IN GOOD CONDITION.
MB1317'
MB1317
MB1317                          STATION RECOVERY (2016)
MB1317
MB1317'RECOVERY NOTE BY GEOCACHING 2016 (RLM)
MB1317'RECOVERED IN GOOD CONDITION.

*** retrieval complete.
Elapsed Time = 00:00:02
```

The NGS Data Sheet

See file dsdata.pdf for more information about the datasheet.

```
PROGRAM = datasheet95, VERSION = 8.12.1
1        National Geodetic Survey,   Retrieval Date = APRIL 22, 2017
KY1710 ***********************************************************************
KY1710  DESIGNATION -  N 177
KY1710  PID         -  KY1710
KY1710  STATE/COUNTY-  OH/WAYNE
KY1710  COUNTRY     -  US
KY1710  USGS QUAD   -  DOYLESTOWN (1994)
KY1710
KY1710                         *CURRENT SURVEY CONTROL
KY1710  ______________________________________________________________________
KY1710* NAD 83(2011) POSITION- 40 56 43.02956(N) 081 43 01.98360(W)   ADJUSTED
KY1710* NAD 83(2011) ELLIP HT-   258.865 (meters)        (06/27/12)   ADJUSTED
KY1710* NAD 83(2011) EPOCH    -  2010.00
KY1710* NAVD 88 ORTHO HEIGHT -   292.011 (meters)      958.04   (feet) ADJUSTED
KY1710  ______________________________________________________________________
KY1710  GEOID HEIGHT    -        -33.177 (meters)                     GEOID12B
KY1710  NAD 83(2011) X  -    695,050.854 (meters)                     COMP
KY1710  NAD 83(2011) Y  - -4,774,444.101 (meters)                     COMP
KY1710  NAD 83(2011) Z  -  4,158,005.194 (meters)                     COMP
KY1710  LAPLACE CORR    -          0.23  (seconds)                    DEFLEC12B
KY1710  DYNAMIC HEIGHT  -        291.882 (meters)      957.62   (feet) COMP
KY1710  MODELED GRAVITY -    980,175.8   (mgal)                       NAVD 88
KY1710
KY1710  VERT ORDER      -  FIRST     CLASS I
KY1710
KY1710  Network accuracy estimates per FGDC Geospatial Positioning Accuracy
KY1710  Standards:
KY1710         FGDC (95% conf, cm)     Standard deviation (cm)     CorrNE
KY1710            Horiz  Ellip           SD_N   SD_E   SD_h      (unitless)
KY1710  ------------------------------------------------------------------
KY1710  NETWORK    7.12   6.92           1.14   3.55   3.53     -0.50110280
KY1710  ------------------------------------------------------------------
KY1710  Click here for local accuracies and other accuracy information.
KY1710
KY1710
KY1710.The horizontal coordinates were established by GPS observations
KY1710.and adjusted by the National Geodetic Survey in June 2012.
KY1710
KY1710.NAD 83(2011) refers to NAD 83 coordinates where the reference frame has
KY1710.been affixed to the stable North American tectonic plate. See
KY1710.NA2011 for more information.
KY1710
KY1710.The horizontal coordinates are valid at the epoch date displayed above
KY1710.which is a decimal equivalence of Year/Month/Day.
KY1710
KY1710.The orthometric height was determined by differential leveling and
KY1710.adjusted by the NATIONAL GEODETIC SURVEY
KY1710.in June 1991.
KY1710
```

```
KY1710.Significant digits in the geoid height do not necessarily reflect accuracy.
KY1710.GEOID12B height accuracy estimate available here.
KY1710
KY1710.Photographs are available for this station.
KY1710
KY1710.The X, Y, and Z were computed from the position and the ellipsoidal ht.
KY1710
KY1710.The Laplace correction was computed from DEFLEC12B derived deflections.
KY1710
KY1710.The ellipsoidal height was determined by GPS observations
KY1710.and is referenced to NAD 83.
KY1710
KY1710.The dynamic height is computed by dividing the NAVD 88
KY1710.geopotential number by the normal gravity value computed on the
KY1710.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
KY1710.degrees latitude (g = 980.6199 gals.).
KY1710
KY1710.The modeled gravity was interpolated from observed gravity values.
KY1710
KY1710. The following values were computed from the NAD 83(2011) position.
KY1710
KY1710;                    North         East     Units Scale Factor Converg.
KY1710;SPC OH N     -   142,281.055   665,909.222   MT  0.99994141   +0 30 51.3
KY1710;SPC OH N     -   466,800.43  2,184,737.17   sFT  0.99994141   +0 30 51.3
KY1710;UTM  17      - 4,532,930.940   439,630.818   MT  0.99964485   -0 28 12.1
KY1710
KY1710!             -  Elev Factor  x  Scale Factor =   Combined Factor
KY1710!SPC OH N     -   0.99995940  x   0.99994141  =   0.99990081
KY1710!UTM  17      -   0.99995940  x   0.99964485  =   0.99960426
KY1710
KY1710_U.S. NATIONAL GRID SPATIAL ADDRESS: 17TMF3963032930(NAD 83)
KY1710
KY1710                           SUPERSEDED SURVEY CONTROL
KY1710
KY1710  NAD 83(2007)-  40 56 43.02977(N)    081 43 01.98459(W) AD(2002.00) 0
KY1710  ELLIP H (02/10/07)  258.875  (m)                       GP(2002.00)
KY1710  ELLIP H (10/07/05)  258.877  (m)                       GP(       ) 4 1
KY1710  NAD 83(1995)-  40 56 43.02942(N)    081 43 01.98467(W) AD(       ) 1
KY1710  ELLIP H (04/01/98)  258.926  (m)                       GP(       ) 4 1
KY1710  NAD 83(1986)-  40 56 43.03737(N)    081 43 01.98939(W) AD(       ) 1
KY1710  NGVD 29 (??/??/92)  292.214  (m)          958.71   (f) ADJ UNCH    1 1
KY1710  NGVD 29             292.23   (m)          958.8    (f) LEVELING    3
KY1710
KY1710.Superseded values are not recommended for survey control.
KY1710
KY1710.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
KY1710.See file dsdata.pdf to determine how the superseded data were derived.
KY1710
KY1710_MARKER: DB = BENCH MARK DISK
KY1710_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
KY1710_STAMPING: N 177 1954
KY1710_MARK LOGO: CGS
KY1710_PROJECTION: PROJECTING 15 CENTIMETERS
KY1710_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
KY1710+STABILITY: SURFACE MOTION
```

```
KY1710_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
KY1710+SATELLITE: SATELLITE OBSERVATIONS - October 19, 2014
KY1710
KY1710  HISTORY     - Date     Condition        Report By
KY1710  HISTORY     - 1954     MONUMENTED       CGS
KY1710  HISTORY     - 1967     GOOD             CGS
KY1710  HISTORY     - 1971     GOOD             OHDT
KY1710  HISTORY     - 19831019 GOOD
KY1710  HISTORY     - 1987     GOOD             OHDT
KY1710  HISTORY     - 20031024 GOOD             USPSQD
KY1710  HISTORY     - 20141019 GOOD             GEOCAC
KY1710
KY1710                          STATION DESCRIPTION
KY1710
KY1710'DESCRIBED BY COAST AND GEODETIC SURVEY 1967
KY1710'3.8 MI SE FROM RITTMAN.
KY1710'ABOUT 3.85 MILES SOUTHEAST ALONG THE BALTIMORE AND OHIO RAILROAD
KY1710'FROM THE STATION AT RITTMAN, IN SECTION 21, R 11 W, T 18 N, 81
KY1710'FEET SOUTHWEST OF AND ACROSS THE TRACK FROM MILEPOLE 148-5,
KY1710'69 FEET SOUTH OF THE CENTER OF THE CROSSING OF TOWNSHIP ROAD
KY1710'NO. 15 AND THE SOUTHWEST ONE OF TWO TRACKS, 42.2 FEET SOUTHWEST
KY1710'OF THE SOUTHWEST RAIL OF THE SOUTHWEST TRACK, 23 FEET SOUTHEAST
KY1710'OF THE CENTER LINE OF THE ROAD, 2 1/2 FEET NORTHEAST OF A FENCE
KY1710'CORNER, 1 FOOT SOUTHEAST OF A METAL WITNESS POST, 2 1/2 FEET
KY1710'BELOW THE LEVEL OF THE TRACK AND SET IN THE TOP OF A CONCRETE
KY1710'POST PROJECTING 0.2 FOOT ABOVE THE LEVEL OF THE GROUND.
KY1710'NOTE-- MARK MAY BE REACHED BY GOING 4.15 MILES NORTHWEST ALONG
KY1710'THE BALTIMORE AND OHIO RAILROAD FROM THE SWITCH TOWER AT WARWICK.
KY1710
KY1710                          STATION RECOVERY (1971)
KY1710
KY1710'RECOVERY NOTE BY OHIO DEPARTMENT OF TRANSPORTATION 1971
KY1710'RECOVERED IN GOOD CONDITION.
KY1710
KY1710                          STATION RECOVERY (1983)
KY1710
KY1710'RECOVERED 1983
KY1710'RECOVERED IN GOOD CONDITION.
KY1710
KY1710                          STATION RECOVERY (1987)
KY1710
KY1710'RECOVERY NOTE BY OHIO DEPARTMENT OF TRANSPORTATION 1987 (ROS)
KY1710'RECOVERED IN GOOD CONDITION.
KY1710
KY1710                          STATION RECOVERY (2003)
KY1710
KY1710'RECOVERY NOTE BY US POWER SQUADRON 2003
KY1710'RECOVERED IN GOOD CONDITION.
KY1710
KY1710                          STATION RECOVERY (2014)
KY1710
KY1710'RECOVERY NOTE BY GEOCACHING 2014 (RLM)
KY1710'RECOVERED IN GOOD CONDITION.

*** retrieval complete.
```

```
Elapsed Time = 00:00:02
```

The NGS Data Sheet

See file dsdata.pdf for more information about the datasheet.

```
PROGRAM = datasheet95, VERSION = 8.12.1
1        National Geodetic Survey,   Retrieval Date = APRIL 20, 2017
KY1900 ***********************************************************************
KY1900  DESIGNATION -  N 287
KY1900  PID         -  KY1900
KY1900  STATE/COUNTY-  OH/WAYNE
KY1900  COUNTRY     -  US
KY1900  USGS QUAD   -  DOYLESTOWN (1994)
KY1900
KY1900                        *CURRENT SURVEY CONTROL
KY1900  ______________________________________________________________________
KY1900* NAD 83(1986) POSITION- 40 53 56.2    (N) 081 40 00.9    (W)    HD_HELD2
KY1900* NAVD 88 ORTHO HEIGHT -   313.723 (meters)     1029.27  (feet) ADJUSTED
KY1900  ______________________________________________________________________
KY1900  GEOID HEIGHT    -        -33.128 (meters)                     GEOID12B
KY1900  DYNAMIC HEIGHT  -        313.584 (meters)     1028.82  (feet) COMP
KY1900  MODELED GRAVITY -    980,172.2   (mgal)                       NAVD 88
KY1900
KY1900  VERT ORDER      -  SECOND    CLASS 0
KY1900
KY1900.The horizontal coordinates were established by autonomous hand held GPS
KY1900.observations and have an estimated accuracy of +/- 10 meters.
KY1900.
KY1900.The orthometric height was determined by differential leveling and
KY1900.adjusted by the NATIONAL GEODETIC SURVEY
KY1900.in June 1991.
KY1900
KY1900.Significant digits in the geoid height do not necessarily reflect accuracy.
KY1900.GEOID12B height accuracy estimate available here.
KY1900
KY1900.Photographs are available for this station.
KY1900
KY1900.The dynamic height is computed by dividing the NAVD 88
KY1900.geopotential number by the normal gravity value computed on the
KY1900.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
KY1900.degrees latitude (g = 980.6199 gals.).
KY1900
KY1900.The modeled gravity was interpolated from observed gravity values.
KY1900
KY1900;                    North         East     Units  Estimated Accuracy
KY1900;SPC OH N     -   137,174.      670,194.      MT  (+/- 10 meters HH2 GPS)
KY1900
KY1900_U.S. NATIONAL GRID SPATIAL ADDRESS: 17TMF4382527753(NAD 83)
KY1900
KY1900                           SUPERSEDED SURVEY CONTROL
KY1900
KY1900  NGVD 29 (??/??/92)  313.956  (m)          1030.04   (f) ADJ UNCH    2 0
KY1900
KY1900.Superseded values are not recommended for survey control.
KY1900
```

```
KY1900.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
KY1900.See file dsdata.pdf to determine how the superseded data were derived.
KY1900
KY1900_MARKER: DB = BENCH MARK DISK
KY1900_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
KY1900_STAMPING: N 287 1959
KY1900_MARK LOGO: CGS
KY1900_PROJECTION: RECESSED 3 CENTIMETERS
KY1900_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
KY1900+STABILITY: SURFACE MOTION
KY1900_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
KY1900+SATELLITE: SATELLITE OBSERVATIONS - December 13, 2014
KY1900
KY1900  HISTORY     - Date     Condition        Report By
KY1900  HISTORY     - 1959     MONUMENTED       CGS
KY1900  HISTORY     - 1971     GOOD             OHDT
KY1900  HISTORY     - 20070331 GOOD             USPSQD
KY1900  HISTORY     - 20141213 GOOD             GEOCAC
KY1900
KY1900                          STATION DESCRIPTION
KY1900
KY1900'DESCRIBED BY COAST AND GEODETIC SURVEY 1959
KY1900'2.3 MI SW FROM WARWICK.
KY1900'ABOUT 0.35 MILE SOUTHEAST ALONG THE BALTIMORE AND OHIO RAILROAD
KY1900'FROM THE CONTROL TOWER AT WARWICK, THENCE ABOUT 1.8 MILES
KY1900'SOUTH ALONG N. LAWRENCE ROAD AND ROAD 103, THENCE ABOUT 1.15
KY1900'MILES WEST ALONG WAYNE COUNTY ROAD 27, ALSO ABOUT 3.65 MILES
KY1900'EAST ALONG WAYNE COUNTY ROAD 27 FROM THE INTERSECTION OF STATE
KY1900'HIGHWAY 548 AT MARSHALLVILLE, WAYNE COUNTY, AT THE INTERSECTION
KY1900'OF ROAD 65, 22 1/2 FEET EAST OF THE CENTER LINE OF ROAD 65,
KY1900'34 FEET NORTH OF THE CENTER LINE OF ROAD 27, 2.7 FEET NORTH
KY1900'OF POWER LINE POLE 1728-19, ABOUT LEVEL WITH THE ROADS, AND SET
KY1900'IN TOP OF A CONCRETE POST PROJECTING 2 INCHES.
KY1900
KY1900                          STATION RECOVERY (1971)
KY1900
KY1900'RECOVERY NOTE BY OHIO DEPARTMENT OF TRANSPORTATION 1971
KY1900'RECOVERED IN GOOD CONDITION.
KY1900
KY1900                          STATION RECOVERY (2007)
KY1900
KY1900'RECOVERY NOTE BY US POWER SQUADRON 2007
KY1900'RECOVERED IN GOOD CONDITION.
KY1900
KY1900                          STATION RECOVERY (2014)
KY1900
KY1900'RECOVERY NOTE BY GEOCACHING 2014 (RLM)
KY1900'RECOVERED IN GOOD CONDITION.  THE MARK IS 6 INCHES (15 CM) SOUTH OF A
KY1900'CARSONITE WITNESS POST.

*** retrieval complete.
Elapsed Time = 00:00:01
```

The NGS Data Sheet

See file dsdata.pdf for more information about the datasheet.

```
PROGRAM = datasheet95, VERSION = 8.12.1
1        National Geodetic Survey,   Retrieval Date = APRIL 22, 2017
MB1307 ***********************************************************************
MB1307  DESIGNATION -  R 176
MB1307  PID         -  MB1307
MB1307  STATE/COUNTY-  OH/MEDINA
MB1307  COUNTRY     -  US
MB1307  USGS QUAD   -  WESTFIELD CENTER (1994)
MB1307
MB1307                        *CURRENT SURVEY CONTROL
MB1307  ______________________________________________________________________
MB1307* NAD 83(2011) POSITION- 41 00 44.74388(N) 081 55 22.68098(W)   ADJUSTED
MB1307* NAD 83(2011) ELLIP HT-   275.939 (meters)        (06/27/12)   ADJUSTED
MB1307* NAD 83(2011) EPOCH    -  2010.00
MB1307* NAVD 88 ORTHO HEIGHT -   309.300 (meters)     1014.76  (feet) ADJUSTED
MB1307  ______________________________________________________________________
MB1307  GEOID HEIGHT    -        -33.343 (meters)                     GEOID12B
MB1307  NAD 83(2011) X  -    677,216.115 (meters)                     COMP
MB1307  NAD 83(2011) Y  - -4,772,080.512 (meters)                     COMP
MB1307  NAD 83(2011) Z  -  4,163,645.886 (meters)                     COMP
MB1307  LAPLACE CORR    -          1.39  (seconds)                    DEFLEC12B
MB1307  DYNAMIC HEIGHT  -        309.163 (meters)     1014.31  (feet) COMP
MB1307  MODELED GRAVITY -    980,172.7   (mgal)                       NAVD 88
MB1307
MB1307  VERT ORDER      -  FIRST     CLASS I
MB1307
MB1307  Network accuracy estimates per FGDC Geospatial Positioning Accuracy
MB1307  Standards:
MB1307         FGDC (95% conf, cm)     Standard deviation (cm)     CorrNE
MB1307            Horiz  Ellip           SD_N   SD_E   SD_h      (unitless)
MB1307  ------------------------------------------------------------------
MB1307  NETWORK    1.58   2.12           0.72   0.55   1.08     -0.09817732
MB1307  ------------------------------------------------------------------
MB1307  Click here for local accuracies and other accuracy information.
MB1307
MB1307
MB1307.The horizontal coordinates were established by GPS observations
MB1307.and adjusted by the National Geodetic Survey in June 2012.
MB1307
MB1307.NAD 83(2011) refers to NAD 83 coordinates where the reference frame has
MB1307.been affixed to the stable North American tectonic plate. See
MB1307.NA2011 for more information.
MB1307
MB1307.The horizontal coordinates are valid at the epoch date displayed above
MB1307.which is a decimal equivalence of Year/Month/Day.
MB1307
MB1307.The orthometric height was determined by differential leveling and
MB1307.adjusted by the NATIONAL GEODETIC SURVEY
MB1307.in June 1991.
MB1307
```

```
MB1307.Significant digits in the geoid height do not necessarily reflect accuracy.
MB1307.GEOID12B height accuracy estimate available here.
MB1307
MB1307.Photographs are available for this station.
MB1307
MB1307.The X, Y, and Z were computed from the position and the ellipsoidal ht.
MB1307
MB1307.The Laplace correction was computed from DEFLEC12B derived deflections.
MB1307
MB1307.The ellipsoidal height was determined by GPS observations
MB1307.and is referenced to NAD 83.
MB1307
MB1307.The dynamic height is computed by dividing the NAVD 88
MB1307.geopotential number by the normal gravity value computed on the
MB1307.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
MB1307.degrees latitude (g = 980.6199 gals.).
MB1307
MB1307.The modeled gravity was interpolated from observed gravity values.
MB1307
MB1307. The following values were computed from the NAD 83(2011) position.
MB1307
MB1307;                     North         East     Units Scale Factor Converg.
MB1307;SPC OH N     -   149,601.844   648,536.377   MT  0.99993960   +0 22 44.7
MB1307;SPC OH N     -   490,818.72  2,127,739.76   sFT  0.99993960   +0 22 44.7
MB1307;UTM  17      - 4,540,547.003   422,391.178   MT  0.99967413   -0 36 20.5
MB1307
MB1307!             -  Elev Factor  x  Scale Factor =   Combined Factor
MB1307!SPC OH N     -   0.99995672  x   0.99993960  =   0.99989632
MB1307!UTM  17      -   0.99995672  x   0.99967413  =   0.99963086
MB1307
MB1307_U.S. NATIONAL GRID SPATIAL ADDRESS: 17TMF2239140547(NAD 83)
MB1307
MB1307                           SUPERSEDED SURVEY CONTROL
MB1307
MB1307  NAD 83(2007)-  41 00 44.74390(N)    081 55 22.68176(W) AD(2002.00) 0
MB1307  ELLIP H (02/10/07)  275.953  (m)                       GP(2002.00)
MB1307  ELLIP H (10/07/05)  275.955  (m)                       GP(       ) 4 2
MB1307  NAD 83(1995)-  41 00 44.74391(N)    081 55 22.68128(W) AD(       ) 1
MB1307  ELLIP H (08/20/03)  275.971  (m)                       GP(       ) 4 2
MB1307  NAVD 88 (08/20/03)  309.3    (m)  GEOID99 model used   GPS OBS
MB1307  NGVD 29 (??/??/92)  309.507  (m)         1015.44   (f) ADJ UNCH    1 1
MB1307
MB1307.Superseded values are not recommended for survey control.
MB1307
MB1307.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
MB1307.See file dsdata.pdf to determine how the superseded data were derived.
MB1307
MB1307_MARKER: DB = BENCH MARK DISK
MB1307_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
MB1307_STAMPING: R 176 1954
MB1307_MARK LOGO: CGS
MB1307_PROJECTION: PROJECTING 3 CENTIMETERS
MB1307_MAGNETIC: N = NO MAGNETIC MATERIAL
MB1307_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
MB1307+STABILITY: SURFACE MOTION
```

```
MB1307_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
MB1307+SATELLITE: SATELLITE OBSERVATIONS - June 04, 2016
MB1307
MB1307  HISTORY     - Date     Condition        Report By
MB1307  HISTORY     - 1954     MONUMENTED       CGS
MB1307  HISTORY     - 1967     GOOD             CGS
MB1307  HISTORY     - 1987     GOOD             USPSQD
MB1307  HISTORY     - 2000     GOOD             OH-103
MB1307  HISTORY     - 20110713 GOOD             JCLS
MB1307  HISTORY     - 20160604 GOOD             GEOCAC
MB1307
MB1307                          STATION DESCRIPTION
MB1307
MB1307'DESCRIBED BY COAST AND GEODETIC SURVEY 1967
MB1307'4.4 MI N FROM CRESTON.
MB1307'ABOUT 2.8 MILES NORTHWEST ALONG THE BALTIMORE AND OHIO RAILROAD
MB1307'FROM THE CROSSING OF STATE HIGHWAY 3 AT CRESTON, THENCE 0.6
MB1307'MILE NORTH ALONG COUNTY ROAD NO. 15, THENCE 0.95 MILE EAST ALONG
MB1307'COUNTY ROAD NO. 46, AT THE WESTFIELD AIRPORT, 113 FEET NORTH OF
MB1307'THE CENTER LINE OF THE COUNTY ROAD, 110 FEET WEST OF THE
MB1307'SOUTHWEST CORNER OF THE TWO-STORIED PORTION OF A WHITE HOUSE,
MB1307'46.2 FEET NORTH OF THE NORTHEAST CORNER OF A CONCRETE BLOCK HANGAR
MB1307'BUILDING, 2 1/2 FEET SOUTHWEST OF THE SOUTHWEST CORNER OF A CONCRETE
MB1307'BASE WHICH FORMERLY SUPPORTED GAS PUMPS, 5 FEET ABOVE THE LEVEL OF THE
MB1307'ROAD AND SET IN THE TOP OF A CONCRETE POST PROJECTING 0.1 FOOT ABOVE
MB1307'THE LEVEL OF THE GROUND.
MB1307
MB1307                          STATION RECOVERY (1987)
MB1307
MB1307'RECOVERY NOTE BY US POWER SQUADRON 1987 (ROS)
MB1307'RECOVERED IN GOOD CONDITION.
MB1307
MB1307                          STATION RECOVERY (2000)
MB1307
MB1307'RECOVERY NOTE BY MEDINA COUNTY OHIO 2000
MB1307'RECOVERY NOTE BY MEDINA COUNTY SANITARY ENGINEER 2000
MB1307'FOUND IN GOOD CONDITION.
MB1307'
MB1307'PROPERTY IS NO LONGER AN ACTIVE AIRPORT AND IS NOW A PRIVATE
MB1307'RESIDENCE.
MB1307
MB1307                          STATION RECOVERY (2011)
MB1307
MB1307'RECOVERY NOTE BY JOHN CHANCE LAND SURVEYS INC 2011
MB1307'RECOVERED IN GOOD CONDITION.
MB1307
MB1307                          STATION RECOVERY (2016)
MB1307
MB1307'RECOVERY NOTE BY GEOCACHING 2016 (RLM)
MB1307'COUNTY ROAD 15 IS ALSO KNOWN AS WESTFIELD ROAD AND COUNTY ROAD 46 IS
MB1307'ALSO KNOWN AS SEVILLE ROAD.  THE WHITE HOUSE AND THE GAS PUMP BASE
MB1307'HAVE BEEN REMOVED.

*** retrieval complete.
Elapsed Time = 00:00:02
```

Section 4: Station Observation Sheets and Photos

This section contains the station observation sheets and photos for all of the LiDAR control stations and recovered geodetic control stations for the USGS OH Chippewa Watershed 2017 B17 LiDAR Project. The stations appear as they are ordered in the final coordinate listing of Section 2. LiDAR quality control stations and CORS were not documented.

WOOLPERT

LiDar Control Stations

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	21-Apr-17
Station Name	1001	File Name	77354TMG042117

Methodology

RTK Base		Photo Control Point (PCP)	
RTK VRS	X	LiDAR Control Point (GCP)	X
Rapid Static		LiDAR QC Point (QCP)	
		Control Station	

Agency	OTHER		
LID	NA		
Hor. Order	NA		
Ver. Order	NA		
Designation	OTHER		

Global Coordinates

Latitude	N41°06'43.49"	Receiver :	
Longitude	W81°59'19.63"	R10	X
Ellipsoidal Height	1143.753 USFT	R8	
		Other, specify	

Type of Mark	GRAVEL	Antenna Height:	6.562 USFT
			2.000 METERS
Mark Stamping	NA		

Start Time :	14:40	Stop Time :	14:43
PDOP Max:	1.8		
Start Time :	14:44	Stop Time :	14:49
PDOP Max:	1.8		

Weather Conditions: 60's, cloudy

LOCATION PHOTO

NORTH

1001, 3E, 21APR2017

1001, 3N, 21APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	21-Apr-17
Station Name	1002	File Name	77354TMG042117

Methodology

RTK Base	
RTK VRS	X
Rapid Static	

Photo Control Point (PCP)	
LiDAR Control Point (GCP)	X
LiDAR QC Point (QCP)	
Control Station	

Agency: OTHER

LID	NA
Hor. Order	NA
Ver. Order	NA
Designation	OTHER

Global Coordinates

Latitude	N41°05'23.06"
Longitude	W81°56'43.04"
Ellipsoidal Height	999.724 USFT

Receiver :

R10	X
R8	
Other, specify	

Type of Mark	CONCRETE
Mark Stamping	NA

Antenna Height: 6.562 USFT / 2.000 METERS

Start Time :	11:43	Stop Time :	11:46
PDOP Max:	2.2		
Start Time :	11:47	Stop Time :	11:50
PDOP Max:	2.0		

Weather Conditions: 60's, cloudy

LOCATION PHOTO

NORTH

1002, 3E, 21APR2017

1002, 3S, 21APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	20-Apr-17
Station Name	1003	File Name	77354TMG042017

Methodology

RTK Base		Photo Control Point (PCP)	
RTK VRS	X	LiDAR Control Point (GCP)	X
Rapid Static		LiDAR QC Point (QCP)	
		Control Station	

Agency	OTHER
LID	NA
Hor. Order	NA
Ver. Order	NA
Designation	OTHER

Global Coordinates

Latitude	N40°58'38.73"
Longitude	W81°54'10.86"
Ellipsoidal Height	872.848 USFT

Type of Mark	CONCRETE
Mark Stamping	NA

Receiver :

R10	X
R8	
Other, specify	

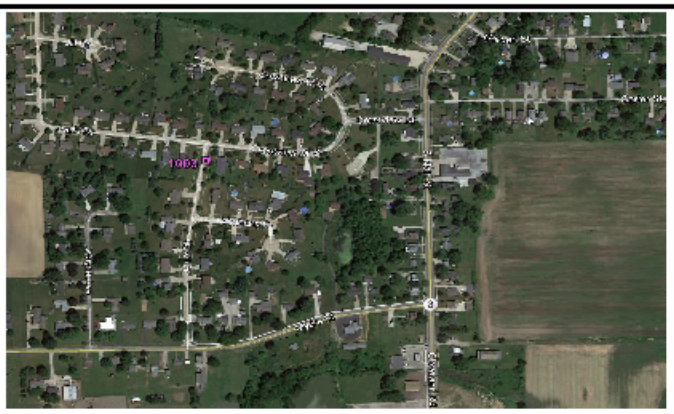
Antenna Height:	6.562	USFT
	2.000	METERS

Start Time :	12:23	Stop Time :	12:26
PDOP Max:	1.4		
Start Time :	12:34	Stop Time :	12:37
PDOP Max:	1.6		

Weather Conditions: 60's -80's, partly cloudy

LOCATION PHOTO

NORTH



1003, 3E, 20APR2017

1003, 3N, 20APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	21-Apr-17
Station Name	1004	File Name	77354TMG042117

Methodology				
	RTK Base		Photo Control Point (PCP)	
	RTK VRS	X	LiDAR Control Point (GCP)	X
	Rapid Static		LiDAR QC Point (QCP)	
			Control Station	

Agency	OTHER
LID	NA
Hor. Order	NA
Ver. Order	NA
Designation	OTHER

Global Coordinates

Latitude	N41°00'32.94"
Longitude	W81°51'33.31"
Ellipsoidal Height	878.275 USFT

Type of Mark	CONCRETE
Mark Stamping	NA

Receiver :	
R10	X
R8	
Other, specify	

Antenna Height:	6.562	USFT	
	2.000	METERS	
Start Time :	9:39	Stop Time :	9:42
PDOP Max:	2.0		
Start Time :	9:43	Stop Time :	9:46
PDOP Max:	1.7		
Weather Conditions	60's, cloudy		

LOCATION PHOTO

NORTH

1004, 3E, 21ARP2017

1004, 3S, 21APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	20-Apr-17
Station Name	1005	File Name	77354TMG042017

Methodology

RTK Base		Photo Control Point (PCP)	
RTK VRS	X	LiDAR Control Point (GCP)	X
Rapid Static		LiDAR QC Point (QCP)	
		Control Station	

Agency	OTHER
LID	NA
Hor. Order	NA
Ver. Order	NA
Designation	OTHER

Global Coordinates

Latitude	N40°58'15.37"
Longitude	W81°48'57.94"
Ellipsoidal Height	866.296 USFT

Receiver :

R10	X
R8	
Other, specify	

Type of Mark	ASPHALT	Antenna Height:	6.562 USFT
			2.000 METERS
Mark Stamping	NA		

Start Time :	11:52	Stop Time :	11:55
PDOP Max:	1.6		
Start Time :	11:56	Stop Time :	11:59
PDOP Max:	1.6		

Weather Conditions: 60's -80's, partly cloudy

LOCATION PHOTO

NORTH

1005, 3E, 20APR2017

1005, 3S, 20APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	19-Apr-17
Station Name	1006	File Name	77354TMG041917

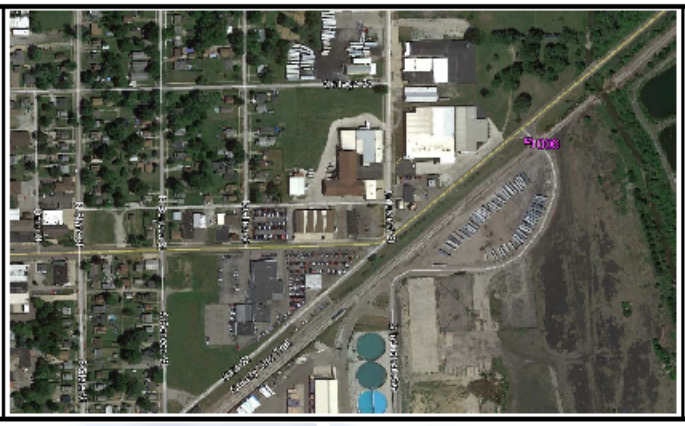
Methodology	RTK Base		
	RTK VRS	X	
	Rapid Static		
	Photo Control Point (PCP)		
	LiDAR Control Point (GCP)	X	
	LiDAR QC Point (QCP)		
	Control Station		Agency: OTHER
	LID: NA		
	Hor. Order: NA		
	Ver. Order: NA		
	Designation: OTHER		

Global Coordinates

Latitude	N40°58'27.11"	Receiver :	
Longitude	W81°46'24.01"	R10	X
Ellipsoidal Height	851.751 USFT	R8	
		Other, specify	
Type of Mark	ASPHALT	Antenna Height:	6.562 USFT
			2.000 METERS
Mark Stamping	NA	Start Time :	13:13 Stop Time : 13:16
		PDOP Max:	1.6
		Start Time :	Stop Time :
		PDOP Max:	
		Weather Conditions	50's - 70's, cloudy, light rain

LOCATION PHOTO

NORTH



1006, 3E, 19APR2017

1006, 3S, 19APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	19-Apr-17
Station Name	1007	File Name	77354TMG041917

Methodology: RTK Base [ ], RTK VRS [X], Rapid Static [ ]

Photo Control Point (PCP) [ ]
LiDAR Control Point (GCP) [X]
LiDAR QC Point (QCP) [ ]
Control Station [ ] Agency: OTHER
LID: NA
Hor. Order: NA
Ver. Order: NA
Designation: OTHER

Global Coordinates

Latitude	N40°57'21.15"
Longitude	W81°43'49.20"
Ellipsoidal Height	857.769 USFT

Receiver :
R10 [X]
R8 [ ]
Other, specify [ ]

Type of Mark	DIRT/GRAVEL
Mark Stamping	NA

Antenna Height: 6.562 USFT / 2.000 METERS

Start Time :	12:52	Stop Time :	12:55
PDOP Max:	1.8		
Start Time :		Stop Time :	
PDOP Max:			

Weather Conditions: 50's - 70's, cloudy, light rain

LOCATION PHOTO

NORTH

1007, 3N, 19APR2017

1007, 3W, 19APR2910

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	20-Apr-17
Station Name	1008	File Name	77354TMG042017

Methodology	RTK Base		
	RTK VRS	X	
	Rapid Static		
Photo Control Point (PCP)			
LiDAR Control Point (GCP)	X		
LiDAR QC Point (QCP)			
Control Station		Agency	OTHER
LID		NA	
Hor. Order		NA	
Ver. Order		NA	
Designation		OTHER	

Global Coordinates

Latitude	N40°56'34.94"	Receiver :	
Longitude	W81°41'14.43"	R10	X
Ellipsoidal Height	908.479 USFT	R8	
		Other, specify	
Type of Mark	ASPHALT	Antenna Height:	6.562 USFT
			2.000 METERS
Mark Stamping	NA		

Start Time :	8:22	Stop Time :	8:25
PDOP Max:	2.0		
Start Time :	8:29	Stop Time :	8:35
PDOP Max:	2.0		
Weather Conditions	60's -80's, partly cloudy		

LOCATION PHOTO

NORTH

1008, 3E, 20APR2017

1008, 3S, 20APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	19-Apr-17
Station Name	1009	File Name	77354TMG041917

Methodology

RTK Base	
RTK VRS	X
Rapid Static	

Photo Control Point (PCP)	
LiDAR Control Point (GCP)	X
LiDAR QC Point (QCP)	
Control Station	

Agency: OTHER

LID	NA
Hor. Order	NA
Ver. Order	NA
Designation	OTHER

Global Coordinates

Latitude	N40°56'19.41"
Longitude	W81°38'39.08"
Ellipsoidal Height	938.384 USFT

Receiver :

R10	X
R8	
Other, specify	

Type of Mark	ASPHALT	Antenna Height:	6.562 USFT
			2.000 METERS
Mark Stamping	NA		
		Start Time :	9:52
		PDOP Max:	2.5
		Start Time :	
		PDOP Max:	

Stop Time : 9:55

Stop Time :

Weather Conditions: 50's - 70's, cloudy, light rain

LOCATION PHOTO

NORTH

1009, 3S, 19APR2017

1009, 3W, 19APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	21-Apr-17
Station Name	2001	File Name	77354TMG042117

Methodology				
	RTK Base		Photo Control Point (PCP)	
	RTK VRS	X	LiDAR Control Point (GCP)	X
	Rapid Static		LiDAR QC Point (QCP)	
			Control Station	

Agency	OTHER		
LID	NA		
Hor. Order	NA		
Ver. Order	NA		
Designation	OTHER		

Global Coordinates

Latitude	N41°05'54.31"	Receiver :	
Longitude	W81°55'58.81"	R10	X
Ellipsoidal Height	924.602 USFT	R8	
		Other, specify	

Type of Mark	DIRT	Antenna Height:	6.562 USFT
			2.000 METERS
Mark Stamping	NA		

Start Time :	11:58	Stop Time :	12:01
PDOP Max:	1.6		
Start Time :	12:02	Stop Time :	12:05
PDOP Max:	1.6		

Weather Conditions: 60's, cloudy

LOCATION PHOTO

NORTH

2001, 3E, 21APR2017

2001, 3S, 21APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	21-Apr-17
Station Name	2002	File Name	77354TMG042117

Methodology: RTK Base [ ], RTK VRS [X], Rapid Static [ ]

Photo Control Point (PCP) [ ]
LiDAR Control Point (GCP) [X]
LiDAR QC Point (QCP) [ ]
Control Station [ ] Agency: OTHER
LID: NA
Hor. Order: NA
Ver. Order: NA
Designation: OTHER

Global Coordinates

Latitude	N41°03'25.30"
Longitude	W81°47'56.20"
Ellipsoidal Height	899.869 USFT

Receiver :
R10 [X]
R8 [ ]
Other, specify [ ]

Type of Mark	GRAVEL	Antenna Height:	6.562 USFT
Mark Stamping	NA		2.000 METERS
		Start Time :	10:13 Stop Time : 10:16
		PDOP Max:	1.8
		Start Time :	10:16 Stop Time : 10:19
		PDOP Max:	1.8
		Weather Conditions	60's, cloudy

LOCATION PHOTO

NORTH

2002, 3N, 21APR2017

2002, 3W, 21APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	20-Apr-17
Station Name	2003	File Name	77354TMG042017

Methodology				
	RTK Base		Photo Control Point (PCP)	
	RTK VRS	X	LiDAR Control Point (GCP)	X
	Rapid Static		LiDAR QC Point (QCP)	
			Control Station	

Agency	OTHER
LID	NA
Hor. Order	NA
Ver. Order	NA
Designation	OTHER

Global Coordinates

Latitude	N41°01'25.08"
Longitude	W81°44'20.51"
Ellipsoidal Height	1024.343 USFT

Type of Mark	DIRT
Mark Stamping	NA

Receiver :	
R10	X
R8	
Other, specify	

Antenna Height:	6.562	USFT	
	2.000	METERS	
Start Time :	16:43	Stop Time :	16:46
PDOP Max:	1.7		
Start Time :	16:46	Stop Time :	16:49
PDOP Max:	1.7		

Weather Conditions: 60's -80's, partly cloudy

LOCATION PHOTO

NORTH

2003, 3E, 20APR2017

2003, 3N, 20APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	19-Apr-17
Station Name	2004	File Name	77354TMG041917

Methodology				
	RTK Base		Photo Control Point (PCP)	
	RTK VRS	X	LiDAR Control Point (GCP)	X
	Rapid Static		LiDAR QC Point (QCP)	
			Control Station	

Agency	OTHER
LID	NA
Hor. Order	NA
Ver. Order	NA
Designation	OTHER

Global Coordinates

Latitude	N40°58'08.77"
Longitude	W81°41'54.91"
Ellipsoidal Height	1148.570 USFT

Type of Mark	GRAVEL
Mark Stamping	NA

Receiver :			
R10	X		
R8			
Other, specify			
Antenna Height:	6.562	USFT	
	2.000	METERS	
Start Time :	11:13	Stop Time :	11:16
PDOP Max:	1.5		
Start Time :		Stop Time :	
PDOP Max:			
Weather Conditions	50's - 70's, cloudy, light rain		

LOCATION PHOTO

NORTH

2004, 3E, 19APR2017

2004, 3N, 19APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	20-Apr-17
Station Name	2005	File Name	77354TMG042017

Methodology				
	RTK Base		Photo Control Point (PCP)	
	RTK VRS	X	LiDAR Control Point (GCP)	X
	Rapid Static		LiDAR QC Point (QCP)	
			Control Station	

Agency	OTHER
LID	NA
Hor. Order	NA
Ver. Order	NA
Designation	OTHER

Global Coordinates

Latitude	N40°56'41.78"
Longitude	W81°44'38.81"
Ellipsoidal Height	855.540 USFT

Type of Mark	ASPHALT
Mark Stamping	NA

Receiver :		
R10	X	
R8		
Other, specify		

Antenna Height:	6.562	USFT	
	2.000	METERS	
Start Time :	7:46	Stop Time :	7:49
PDOP Max:	1.5		
Start Time :		Stop Time :	
PDOP Max:			

Weather Conditions: 60's -80's, partly cloudy

LOCATION PHOTO

NORTH

2005, 3S, 18APR2017

2005, 3W, 18APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	19-Apr-17
Station Name	2006	File Name	77354TMG041917

Methodology				
	RTK Base		Photo Control Point (PCP)	
	RTK VRS	X	LiDAR Control Point (GCP)	X
	Rapid Static		LiDAR QC Point (QCP)	
			Control Station	

Agency	OTHER
LID	NA
Hor. Order	NA
Ver. Order	NA
Designation	OTHER

Global Coordinates

Latitude	N40°54'02.77"
Longitude	W81°44'22.29"
Ellipsoidal Height	1000.660 USFT

Type of Mark	DIRT
Mark Stamping	NA

Receiver :	
R10	X
R8	
Other, specify	

Antenna Height:	6.562	USFT	
	2.000	METERS	
Start Time :	16:49	Stop Time :	16:52
PDOP Max:	1.5		
Start Time :		Stop Time :	
PDOP Max:			

Weather Conditions: 50's - 70's, cloudy, light rain

LOCATION PHOTO

NORTH

2006, 3E, 18APR2017

2006, 3N, 18APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	17-Apr-17
Station Name	2007	File Name	77354TMG041717

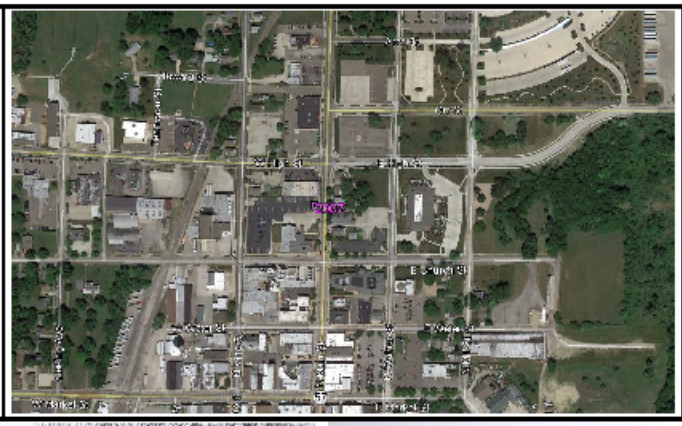
Methodology	RTK Base		
	RTK VRS	X	
	Rapid Static		
	Photo Control Point (PCP)		
	LiDAR Control Point (GCP)	X	
	LiDAR QC Point (QCP)		
	Control Station		Agency: OTHER
	LID		NA
	Hor. Order		NA
	Ver. Order		NA
	Designation		OTHER

Global Coordinates

Latitude	N40°50'34.77"	Receiver :	
Longitude	W81°45'51.72"	R10	X
Ellipsoidal Height	952.908 USFT	R8	
		Other, specify	
Type of Mark	ASPHALT	Antenna Height:	6.562 USFT
			2.000 METERS
Mark Stamping	NA	Start Time :	16:12 Stop Time : 16:20
		PDOP Max:	2.2
		Start Time :	Stop Time :
		PDOP Max:	
		Weather Conditions	60's, partly cloudy

LOCATION PHOTO

NORTH



2007, 3E, 17APR2017

2007, 3S, 17APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	20-Apr-17
Station Name	2008	File Name	77354TMG042017

Methodology				
	RTK Base		Photo Control Point (PCP)	
	RTK VRS	X	LiDAR Control Point (GCP)	X
	Rapid Static		LiDAR QC Point (QCP)	
			Control Station	

Agency	OTHER		
LID	NA		
Hor. Order	NA		
Ver. Order	NA		
Designation	OTHER		

Global Coordinates

Latitude	N40°58'04.61"	Receiver :	
Longitude	W81°50'51.60"	R10	X
Ellipsoidal Height	859.222 USFT	R8	
		Other, specify	

Type of Mark	GRAVEL	Antenna Height:	6.562 USFT
			2.000 METERS
Mark Stamping	NA		

Start Time :	11:07	Stop Time :	11:10
PDOP Max:	1.8		
Start Time :	11:10	Stop Time :	11:13
PDOP Max:	1.8		

Weather Conditions: 60's -80's, partly cloudy

LOCATION PHOTO

NORTH

2008, 3E, 20APR2017

2008, 3N, 20APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	20-Apr-17
Station Name	2009	File Name	77354TMG042017

Methodology			Photo Control Point (PCP)		
	RTK Base		LiDAR Control Point (GCP)	X	
	RTK VRS	X	LiDAR QC Point (QCP)		
	Rapid Static		Control Station		Agency: OTHER
			LID: NA		
			Hor. Order: NA		
			Ver. Order: NA		
			Designation: OTHER		

Global Coordinates

Latitude	N40°58'25.54"
Longitude	W81°48'08.92"
Ellipsoidal Height	1001.677 USFT
Type of Mark	ASPHALT
Mark Stamping	NA

Receiver :		
R10	X	
R8		
Other, specify		
Antenna Height:	6.562	USFT
	2.000	METERS
Start Time :	9:29	Stop Time : 9:32
PDOP Max:	2.0	
Start Time :	9:32	Stop Time : 9:37
PDOP Max:	2.0	
Weather Conditions	60's -80's, partly cloudy	

LOCATION PHOTO

NORTH

2009, 2S, 20APR2017

1009, 3W, 19APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	20-Apr-17
Station Name	2010	File Name	77354TMG042017

Methodology				
	RTK Base		Photo Control Point (PCP)	
	RTK VRS	X	LiDAR Control Point (GCP)	X
	Rapid Static		LiDAR QC Point (QCP)	
			Control Station	

Agency	OTHER		
LID	NA		
Hor. Order	NA		
Ver. Order	NA		
Designation	OTHER		

Global Coordinates

Latitude	N40°59'26.61"	Receiver :	
Longitude	W81°53'22.51"	R10	X
Ellipsoidal Height	882.600 USFT	R8	
		Other, specify	

Type of Mark	DIRT	Antenna Height:	6.562 USFT
			2.000 METERS
Mark Stamping	NA		

Start Time :	12:48	Stop Time :	12:51
PDOP Max:	1.5		
Start Time :	12:52	Stop Time :	12:58
PDOP Max:	1.5		

Weather Conditions: 60's -80's, partly cloudy

LOCATION PHOTO

NORTH

2010, 3S, 20APR2017

2010, 3W, 20APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	21-Apr-17
Station Name	2011	File Name	77354TMG042117

Methodology

RTK Base		Photo Control Point (PCP)	
RTK VRS	X	LiDAR Control Point (GCP)	X
Rapid Static		LiDAR QC Point (QCP)	
		Control Station	

Agency: OTHER

LID	NA
Hor. Order	NA
Ver. Order	NA
Designation	OTHER

Global Coordinates

Latitude	N41°04'02.30"
Longitude	W81°54'09.32"
Ellipsoidal Height	896.915 USFT

Receiver :

R10	X
R8	
Other, specify	

Type of Mark	ASPHALT	Antenna Height:	6.562 USFT
			2.000 METERS
Mark Stamping	NA		

Start Time :	11:12	Stop Time :	11:15
PDOP Max:	1.8		
Start Time :	11:15	Stop Time :	11:18
PDOP Max:	2.1		

Weather Conditions: 60's, cloudy

LOCATION PHOTO

NORTH

2011, 3N, 21APR2017

2011, 3W, 21APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	18-Apr-17
Station Name	2012	File Name	77354TMG041817

Methodology				
	RTK Base		Photo Control Point (PCP)	
	RTK VRS	X	LiDAR Control Point (GCP)	X
	Rapid Static		LiDAR QC Point (QCP)	
			Control Station	

Agency	OTHER		
LID	NA		
Hor. Order	NA		
Ver. Order	NA		
Designation	OTHER		

Global Coordinates

Latitude	N40°54'58.84"	Receiver :	
Longitude	W81°54'34.92"	R10	X
Ellipsoidal Height	1037.017 USFT	R8	
		Other, specify	

Type of Mark	ASPHALT	Antenna Height:	6.562 USFT
			2.000 METERS
Mark Stamping	NA		

Start Time :	10:30	Stop Time :	10:33
PDOP Max:	1.7		
Start Time :	10:34	Stop Time :	10:37
PDOP Max:	2.1		

Weather Conditions: 50's - 60's, sunny

LOCATION PHOTO

NORTH

2012, 3N, 21APR2017

2012, 3W, 21APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	19-Apr-17
Station Name	2013	File Name	77354TMG041917

Methodology: RTK Base [ ] RTK VRS [X] Rapid Static [ ]

Photo Control Point (PCP) [ ]
LiDAR Control Point (GCP) [X]
LiDAR QC Point (QCP) [ ]
Control Station [ ] Agency: OTHER
LID: NA
Hor. Order: NA
Ver. Order: NA
Designation: OTHER

Global Coordinates

Latitude	N40°54'58.50"
Longitude	W81°48'38.06"
Ellipsoidal Height	927.716 USFT

Receiver :
R10 [X]
R8 [ ]
Other, specify [ ]

Type of Mark: GRAVEL
Mark Stamping: NA

Antenna Height: 6.562 USFT / 2.000 METERS

Start Time : 15:28 Stop Time : 15:31
PDOP Max: 1.4
Start Time : Stop Time :
PDOP Max:

Weather Conditions: 50's - 70's, cloudy, light rain

LOCATION PHOTO

NORTH

2013, 3N, 18APR2017

2013, 3W, 18APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	21-Apr-17
Station Name	2014	File Name	77354TMG042117

Methodology

RTK Base		Photo Control Point (PCP)	
RTK VRS	X	LiDAR Control Point (GCP)	X
Rapid Static		LiDAR QC Point (QCP)	
		Control Station	

Agency: OTHER

LID	NA
Hor. Order	NA
Ver. Order	NA
Designation	OTHER

Global Coordinates

Latitude	N41°06'21.22"
Longitude	W81°51'31.52"
Ellipsoidal Height	1097.553 USFT

Receiver :

R10	X
R8	
Other, specify	

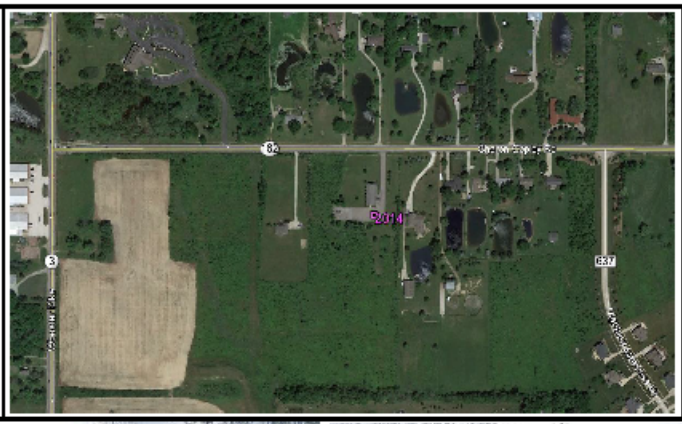
Type of Mark	ASPHALT	Antenna Height:	6.562 USFT
			2.000 METERS
Mark Stamping	NA		

Start Time :	13:46	Stop Time :	13:49
PDOP Max:	2.7		
Start Time :	13:54	Stop Time :	14:09
PDOP Max:	1.6		

Weather Conditions: 60's, cloudy

LOCATION PHOTO

NORTH



2014, 3S, 21APR2017

2014, 3W, 21APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	21-Apr-17
Station Name	2015	File Name	77354TMG042117

Methodology

RTK Base		Photo Control Point (PCP)	
RTK VRS	X	LiDAR Control Point (GCP)	X
Rapid Static		LiDAR QC Point (QCP)	
		Control Station	

Agency	OTHER		
LID	NA		
Hor. Order	NA		
Ver. Order	NA		
Designation	OTHER		

Global Coordinates

Latitude	N41°07'38.27"	Receiver :	
Longitude	W81°58'38.13"	R10	X
Ellipsoidal Height	1020.526 USFT	R8	
		Other, specify	

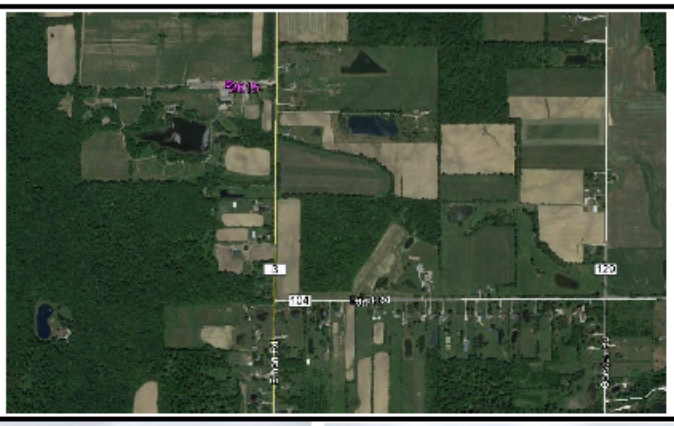
Type of Mark	GRAVEL	Antenna Height:	6.562 USFT
			2.000 METERS
Mark Stamping	NA		

Start Time :	12:17	Stop Time :	12:20
PDOP Max:	1.6		
Start Time :	12:20	Stop Time :	12:23
PDOP Max:	1.6		

Weather Conditions: 60's, cloudy

LOCATION PHOTO

NORTH



2015, 3N, 21APR2017

2015, 3W, 21APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	17-Apr-17
Station Name	2016	File Name	77354TMG041717

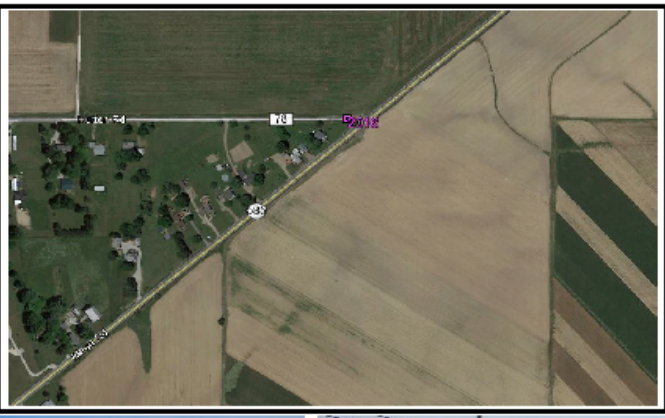
Methodology			Photo Control Point (PCP)		
	RTK Base		LiDAR Control Point (GCP)	X	
	RTK VRS	X	LiDAR QC Point (QCP)		
	Rapid Static		Control Station		Agency OTHER
			LID	NA	
			Hor. Order	NA	
			Ver. Order	NA	
			Designation	OTHER	

Global Coordinates

Latitude	N40°52'52.33"	Receiver :		
Longitude	W81°49'50.33"	R10	X	
Ellipsoidal Height	1065.331 USFT	R8		
		Other, specify		
Type of Mark	ASPHALT	Antenna Height:	6.562	USFT
			2.000	METERS
Mark Stamping	NA			
		Start Time :	17:06	Stop Time : 17:14
		PDOP Max:	2.0	
		Start Time :		Stop Time :
		PDOP Max:		
		Weather Conditions	60's, partly cloudy	

LOCATION PHOTO

NORTH



2016, 3E, 17APR2017

2016, 3S, 17APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	19-Apr-17
Station Name	2017	File Name	77354TMG041917

Methodology: RTK Base [ ], RTK VRS [X], Rapid Static [ ]

Photo Control Point (PCP) [ ]
LiDAR Control Point (GCP) [X]
LiDAR QC Point (QCP) [ ]
Control Station [ ] Agency: OTHER
LID: NA
Hor. Order: NA
Ver. Order: NA
Designation: OTHER

Global Coordinates

Latitude	N40°54'34.28"
Longitude	W81°39'39.76"
Ellipsoidal Height	1020.031 USFT

Receiver :
R10 [X]
R8 [ ]
Other, specify [ ]

Type of Mark: GRAVEL
Mark Stamping: NA

Antenna Height: 6.562 USFT / 2.000 METERS

Start Time : 17:17 Stop Time : 17:20
PDOP Max: 4.5
Start Time : Stop Time :
PDOP Max:

Weather Conditions: 50's - 70's, cloudy, light rain

LOCATION PHOTO

NORTH

2017, 3S, 18APR2017

2017, 3W, 18APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	21-Apr-17
Station Name	2018	File Name	77354TMG042117

Methodology

RTK Base	
RTK VRS	X
Rapid Static	

Photo Control Point (PCP)	
LiDAR Control Point (GCP)	X
LiDAR QC Point (QCP)	
Control Station	

Agency	OTHER		
LID	NA		
Hor. Order	NA		
Ver. Order	NA		
Designation	OTHER		

Global Coordinates

Latitude	N41°02'32.77"
Longitude	W81°49'17.00"
Ellipsoidal Height	1103.144 USFT

Type of Mark	ASPHALT
Mark Stamping	NA

Receiver :

R10	X
R8	
Other, specify	

Antenna Height:	6.562	USFT
	2.000	METERS

Start Time :	9:59	Stop Time :	10:01
PDOP Max:	1.5		
Start Time :	10:02	Stop Time :	10:05
PDOP Max:	1.7		

Weather Conditions: 60's, cloudy

LOCATION PHOTO

NORTH

2018, 3E, 21APR2017

2018, 3N, 21APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	20-Apr-17
Station Name	2019	File Name	77354TMG042017

Methodology			Photo Control Point (PCP)		
	RTK Base		LiDAR Control Point (GCP)	X	
	RTK VRS	X	LiDAR QC Point (QCP)		
	Rapid Static		Control Station		Agency: OTHER
			LID: NA		
			Hor. Order: NA		
			Ver. Order: NA		
			Designation: OTHER		

Global Coordinates

Latitude	N41°02'16.81"	Receiver :		
Longitude	W81°55'37.92"	R10	X	
Ellipsoidal Height	1055.324 USFT	R8		
		Other, specify		
Type of Mark	CONCRETE	Antenna Height:	6.562	USFT
			2.000	METERS
Mark Stamping	NA			
		Start Time :	15:04	Stop Time : 15:07
		PDOP Max:	1.7	
		Start Time :	15:09	Stop Time : 15:12
		PDOP Max:	1.5	
		Weather Conditions	60's -70's, partly cloudy	

LOCATION PHOTO

NORTH

2019, 3E, 20APR2017

2019, 3S, 20APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	20-Apr-17
Station Name	2020	File Name	77354TMG042017

Methodology

RTK Base	
RTK VRS	X
Rapid Static	

Photo Control Point (PCP)	
LiDAR Control Point (GCP)	X
LiDAR QC Point (QCP)	
Control Station	

Agency: OTHER

LID	NA
Hor. Order	NA
Ver. Order	NA
Designation	OTHER

Global Coordinates

Latitude	N41°00'25.23"
Longitude	W81°46'51.87"
Ellipsoidal Height	1035.582 USFT

Receiver :

R10	X
R8	
Other, specify	

Type of Mark	GRAVEL
Mark Stamping	NA

Antenna Height: 6.562 USFT / 2.000 METERS

Start Time :	16:22	Stop Time :	16:25
PDOP Max:	1.5		
Start Time :	16:26	Stop Time :	16:29
PDOP Max:	1.5		

Weather Conditions: 60's -70's, partly cloudy

LOCATION PHOTO

NORTH

2020, 3E, 20APR2017

2020, 3N, 20APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	21-Apr-17
Station Name	2021	File Name	77354TMG042117

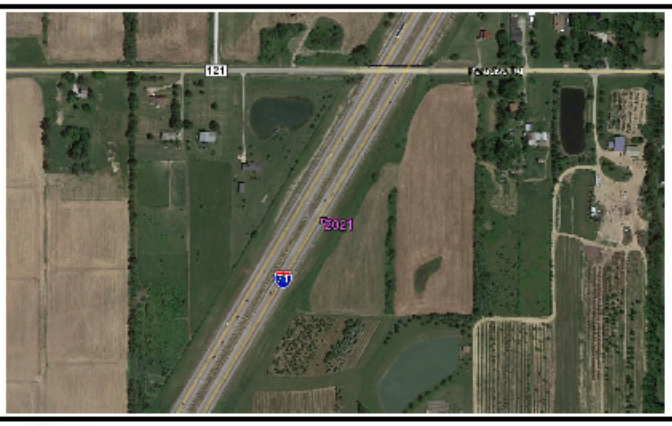
Methodology			Photo Control Point (PCP)		
	RTK Base		LiDAR Control Point (GCP)	X	
	RTK VRS	X	LiDAR QC Point (QCP)		
	Rapid Static		Control Station		Agency OTHER
			LID	NA	
			Hor. Order	NA	
			Ver. Order	NA	
			Designation	OTHER	

Global Coordinates

Latitude	N41°04'34.77"	Receiver :		
Longitude	W81°50'26.18"	R10	X	
Ellipsoidal Height	1124.816 USFT	R8		
		Other, specify		
Type of Mark	ASPHALT	Antenna Height:	6.562	USFT
			2.000	METERS
Mark Stamping	NA			
		Start Time :	10:36	Stop Time : 10:39
		PDOP Max:	1.6	
		Start Time :	10:39	Stop Time : 10:42
		PDOP Max:	1.7	
		Weather Conditions	60's, cloudy	

LOCATION PHOTO

NORTH



2021, 3E, 21APR2017

2021, 3N, 21APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	20-Apr-17
Station Name	2022	File Name	77354TMG042017

Methodology

RTK Base		Photo Control Point (PCP)	
RTK VRS	X	LiDAR Control Point (GCP)	X
Rapid Static		LiDAR QC Point (QCP)	
		Control Station	

Agency	OTHER
LID	NA
Hor. Order	NA
Ver. Order	NA
Designation	OTHER

Global Coordinates

Latitude	N41°01'37.42"
Longitude	W81°52'09.68"
Ellipsoidal Height	898.736 USFT

Type of Mark	CONCRETE
Mark Stamping	NA

Receiver :

R10	X
R8	
Other, specify	

Antenna Height:	6.562	USFT	
	2.000	METERS	
Start Time :	16:01	Stop Time :	16:04
PDOP Max:	1.5		
Start Time :	16:05	Stop Time :	16:08
PDOP Max:	1.7		
Weather Conditions	60's -70's, partly cloudy		

LOCATION PHOTO

NORTH

2022, 3E, 20APR2017

2022, 3N, 20APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	23-Apr-17
Station Name	2023	File Name	77354TMG042317

Methodology				
	RTK Base		Photo Control Point (PCP)	
	RTK VRS	X	LiDAR Control Point (GCP)	X
	Rapid Static		LiDAR QC Point (QCP)	
			Control Station	

Agency	OTHER		
LID	NA		
Hor. Order	NA		
Ver. Order	NA		
Designation	OTHER		

Global Coordinates

Latitude	N41°08'09.33"	Receiver :	
Longitude	W81°54'36.83"	R10	X
Ellipsoidal Height	991.604 USFT	R8	
		Other, specify	

Type of Mark	CONCRETE	Antenna Height:	6.562 USFT
			2.000 METERS
Mark Stamping	NA		

Start Time :	17:26	Stop Time :	17:29
PDOP Max:	2.2		
Start Time :	17:29	Stop Time :	17:32
PDOP Max:	1.6		

Weather Conditions: 50's -60's, sunny

LOCATION PHOTO

NORTH

2023, 3E, 23APR2017

2023, 3S, 23APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	21-Apr-17
Station Name	2024	File Name	77354TMG042117

Methodology: RTK Base [ ], RTK VRS [X], Rapid Static [ ]

Photo Control Point (PCP) [ ]
LiDAR Control Point (GCP) [X]
LiDAR QC Point (QCP) [ ]
Control Station [ ] Agency: OTHER
LID: NA
Hor. Order: NA
Ver. Order: NA
Designation: OTHER

Global Coordinates

Latitude	N41°04'09.27"
Longitude	W81°56'21.36"
Ellipsoidal Height	1021.428 USFT

Receiver :
R10 [X]
R8 [ ]
Other, specify [ ]

Type of Mark	ASPHALT	Antenna Height:	6.562 USFT
Mark Stamping	NA		2.000 METERS
		Start Time :	11:28 Stop Time : 11:31
		PDOP Max:	1.9
		Start Time :	11:32 Stop Time : 11:35
		PDOP Max:	1.9
		Weather Conditions	60's, cloudy

LOCATION PHOTO

NORTH

2024, 3S, 21APR2017

2024, 3W, 21APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	19-Apr-17
Station Name	2025	File Name	77354TMG041917

Methodology

RTK Base	
RTK VRS	X
Rapid Static	

Photo Control Point (PCP)	
LiDAR Control Point (GCP)	X
LiDAR QC Point (QCP)	
Control Station	

Agency: OTHER

LID	NA
Hor. Order	NA
Ver. Order	NA
Designation	OTHER

Global Coordinates

Latitude	N40°57'00.45"
Longitude	W81°39'27.31"
Ellipsoidal Height	1059.397 USFT

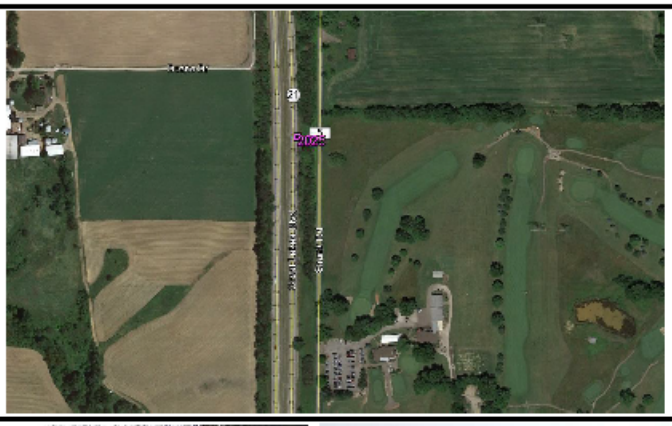
Receiver :

R10	X
R8	
Other, specify	

Type of Mark	ASPHALT	Antenna Height:	6.562 USFT
			2.000 METERS
Mark Stamping	NA		
		Start Time :	10:57 Stop Time : 11:00
		PDOP Max:	2.2
		Start Time :	Stop Time :
		PDOP Max:	
		Weather Conditions	50's - 70's, cloudy, light rain

LOCATION PHOTO

NORTH



2025, 3N, 19APR2017

2025, 3W, 19APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	21-Apr-17
Station Name	3001	File Name	77354TMG042117

Methodology			Photo Control Point (PCP)		
	RTK Base		LiDAR Control Point (GCP)		
	RTK VRS	X	LiDAR QC Point (QCP)	X	
	Rapid Static		Control Station		Agency: OTHER
			LID	NA	
			Hor. Order	NA	
			Ver. Order	NA	
			Designation	OTHER	

Global Coordinates

Latitude	N41°07'44.89"	Receiver :		
Longitude	W81°58'31.69"	R10	X	
Ellipsoidal Height	1027.585 USFT	R8		
		Other, specify		
Type of Mark	FOREST	Antenna Height:	6.562	USFT
			2.000	METERS
Mark Stamping	NA	Start Time :	12:35	Stop Time : 12:38
		PDOP Max:	2.3	
		Start Time :	12:39	Stop Time : 12:42
		PDOP Max:	1.8	
		Weather Conditions	60's, cloudy	

LOCATION PHOTO

NORTH

3001, 3E, 21APR2017

3001, 3S, 21APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	20-Apr-17
Station Name	3002	File Name	77354TMG042017

Methodology: RTK Base [ ] RTK VRS [X] Rapid Static [ ]

Photo Control Point (PCP) [ ]
LiDAR Control Point (GCP) [ ]
LiDAR QC Point (QCP) [X]
Control Station [ ] Agency: OTHER
LID: NA
Hor. Order: NA
Ver. Order: NA
Designation: OTHER

Global Coordinates

Latitude	N41°02'34.71"
Longitude	W81°44'57.23"
Ellipsoidal Height	1062.034 USFT

Receiver :
R10 [X]
R8 [ ]
Other, specify [ ]

Type of Mark: FOREST
Mark Stamping: NA

Antenna Height: 6.562 USFT / 2.000 METERS

Start Time :	17:04	Stop Time :	17:07
PDOP Max:	1.9		
Start Time :	17:08	Stop Time :	17:11
PDOP Max:	2.1		

Weather Conditions: 60's -70's, partly cloudy

LOCATION PHOTO

NORTH

3002, 3E, 20APR2017

3002, 3N, 20APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	19-Apr-17
Station Name	3003	File Name	77354TMG041917

Methodology				
	RTK Base		Photo Control Point (PCP)	
	RTK VRS		LiDAR Control Point (GCP)	
	Rapid Static		LiDAR QC Point (QCP)	X
	Conventional	X	Control Station	

Agency	OTHER		
LID	NA		
Hor. Order	NA		
Ver. Order	NA		
Designation	OTHER		

Global Coordinates

Latitude	N41°02'32.77"	Receiver :	
Longitude	W81°49'17.00"	R10	
Ellipsoidal Height	1103.144 USFT	R8	
		Other, specify	

Type of Mark	ASPHALT	Antenna Height:	8.300 USFT
			2.530 METERS
Mark Stamping	NA		

Start Time :	17:47	Stop Time :	17:48
PDOP Max:	NA		
Start Time :		Stop Time :	
PDOP Max:			

Weather Conditions: 50's - 70's, cloudy, light rain

LOCATION PHOTO

NORTH

3003, 3E, 21APR2017

3003, 3N, 21APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	20-Apr-17
Station Name	3004	File Name	77354TMG042017

Methodology

RTK Base	
RTK VRS	X
Rapid Static	

Photo Control Point (PCP)	
LiDAR Control Point (GCP)	
LiDAR QC Point (QCP)	X
Control Station	

Agency: OTHER

LID	NA
Hor. Order	NA
Ver. Order	NA
Designation	OTHER

Global Coordinates

Latitude	N40°58'16.97"
Longitude	W81°51'11.49"
Ellipsoidal Height	862.448 USFT

Receiver :

R10	X
R8	
Other, specify	

Type of Mark	TALL WEEDS
Mark Stamping	NA

Antenna Height: 6.562 USFT / 2.000 METERS

Start Time :	11:21	Stop Time :	11:24
PDOP Max:	1.5		
Start Time :	11:28	Stop Time :	11:31
PDOP Max:	1.7		

Weather Conditions: 60's -70's, partly cloudy

LOCATION PHOTO

NORTH

3004, 3S, 21APR2017

3004, 3W, 21APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	20-Apr-17
Station Name	3005	File Name	77354TMG042017

Methodology

RTK Base	
RTK VRS	X
Rapid Static	

Photo Control Point (PCP)	
LiDAR Control Point (GCP)	
LiDAR QC Point (QCP)	X
Control Station	

Agency	OTHER		
LID	NA		
Hor. Order	NA		
Ver. Order	NA		
Designation	OTHER		

Global Coordinates

Latitude	N41°01'54.56"
Longitude	W81°53'46.29"
Ellipsoidal Height	882.281 USFT

Type of Mark	BRUSH
Mark Stamping	NA

Receiver :

R10	X
R8	
Other, specify	

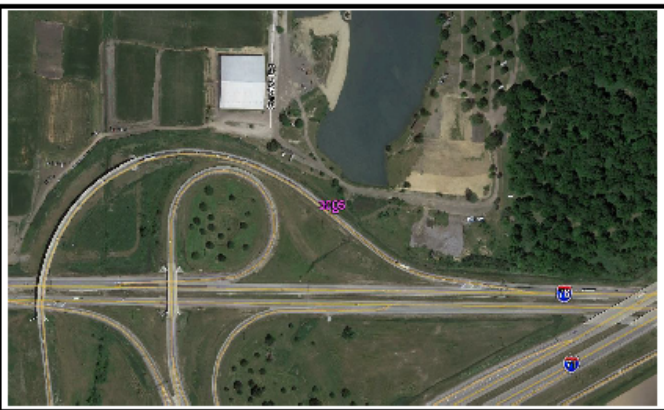
Antenna Height:	6.562	USFT	
	2.000	METERS	
Start Time :	15:34	Stop Time :	15:37
PDOP Max:	1.3		
Start Time :	15:37	Stop Time :	15:40
PDOP Max:	1.4		

v

Weather Conditions: 60's -70's, partly cloudy

LOCATION PHOTO

NORTH



3005, 3E, 20APR2017

3005, 3N, 20APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	21-Apr-17
Station Name	3006	File Name	77354TMG042117

Methodology

RTK Base	
RTK VRS	X
Rapid Static	

Photo Control Point (PCP)	
LiDAR Control Point (GCP)	
LiDAR QC Point (QCP)	X
Control Station	

Agency: OTHER

LID	NA
Hor. Order	NA
Ver. Order	NA
Designation	OTHER

Global Coordinates

Latitude	N41°07'12.79"
Longitude	W81°54'06.74"
Ellipsoidal Height	983.231 USFT

Receiver :

R10	X
R8	
Other, specify	

Type of Mark	BRUSH
Mark Stamping	NA

Antenna Height: 6.562 USFT / 2.000 METERS

Start Time :	13:01	Stop Time :	13:04
PDOP Max:	1.7		
Start Time :	13:21	Stop Time :	13:24
PDOP Max:			

Weather Conditions: 60's, cloudy

LOCATION PHOTO

NORTH

3006, 3E, 21APR2017

3006, 3S, 21APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	17-Apr-17
Station Name	3007	File Name	77354TMG041717

Methodology: RTK Base [ ] RTK VRS [X] Rapid Static [ ]

Photo Control Point (PCP) [ ]
LiDAR Control Point (GCP) [ ]
LiDAR QC Point (QCP) [X]
Control Station [ ] Agency: OTHER
LID: NA
Hor. Order: NA
Ver. Order: NA
Designation: OTHER

Global Coordinates

Latitude	N40°50'38.68"
Longitude	W81°45'01.70"
Ellipsoidal Height	903.646 USFT

Receiver :
R10 [X]
R8 [ ]
Other, specify [ ]

Type of Mark: TALL WEEDS
Mark Stamping: NA

Antenna Height: 6.562 USFT / 2.000 METERS

Start Time : 16:33 Stop Time : 16:40
PDOP Max: 1.5
Start Time : Stop Time :
PDOP Max:

Weather Conditions: 60's, partly cloudy

LOCATION PHOTO

NORTH

3007, 3N, 17APR2017

3007, 3W, 17APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	19-Apr-17
Station Name	3008	File Name	77354TMG041917

Methodology: RTK Base [ ], RTK VRS [X], Rapid Static [ ]

Photo Control Point (PCP) [ ]
LiDAR Control Point (GCP) [ ]
LiDAR QC Point (QCP) [X]
Control Station [ ] Agency: OTHER
LID: NA
Hor. Order: NA
Ver. Order: NA
Designation: OTHER

Global Coordinates

Latitude	N40°54'58.85"
Longitude	W81°51'53.78"
Ellipsoidal Height	1027.023 USFT

Receiver :
R10 [X]
R8 [ ]
Other, specify [ ]

Type of Mark: TALL WEEDS
Mark Stamping: NA

Antenna Height: 6.562 USFT / 2.000 METERS

Start Time : 15:18 Stop Time : 15:21
PDOP Max: 1.5
Start Time : Stop Time :
PDOP Max:

Weather Conditions: 50's - 70's, cloudy, light rain

LOCATION PHOTO

NORTH

3008, 3N, 18APR2017

3008, 3W, 18APR2017

Woolpert Base Stations, Geodetic Control Stations and/or Geodetic Control Station Checks

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	19-Apr-17
Station Name	CHIP	File Name	77354TMG041917

Methodology	RTK Base		
	RTK VRS	X	
	Rapid Static		
Photo Control Point (PCP)			
LiDAR Control Point (GCP)			
LiDAR QC Point (QCP)			
Control Station	X	Agency	NGS
LID		NA	
Hor. Order		0	
Ver. Order		SECOND CLASS 0	
Designation		OTHER	

Global Coordinates

Latitude	N40°53'05.52"	Receiver :	
Longitude	W81°45'47.10"	R10	X
Ellipsoidal Height	1122.547 USFT	R8	
		Other, specify	
Type of Mark	DOME IN CONCRETE	Antenna Height:	6.562 USFT
			2.000 METERS
Mark Stamping	CHIP 1959		

Start Time :	14:54	Stop Time :	14:57
PDOP Max:	2.3		
Start Time :	14:58	Stop Time :	15:01
PDOP Max:	1.7		
Weather Conditions	50's - 70's, cloudy, light rain		

LOCATION PHOTO

NORTH

CHIP, KY1839, 3N, 21APR2017

CHIP, KY1839, 3S, 21APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	17-Apr-17
Station Name	CHIP RM 2	File Name	77354TMG041717

Methodology: RTK Base [ ], RTK VRS [X], Rapid Static [ ]

Photo Control Point (PCP) [ ]
LiDAR Control Point (GCP) [ ]
LiDAR QC Point (QCP) [ ]
Control Station [X] Agency: NGS
LID: NA
Hor. Order: NA
Ver. Order: SECOND CLASS 0
Designation: OTHER

Global Coordinates

Latitude	N40°53'05.27"
Longitude	W81°45'47.08"
Ellipsoidal Height	1014.375 USFT

Receiver:
R10 [X]
R8 [ ]
Other, specify [ ]

Type of Mark: DOME IN CONCRETE
Mark Stamping: CHIP NO 2 1959

Antenna Height: 6.562 USFT / 2.000 METERS

Start Time: 15:31 Stop Time: 15:40
PDOP Max: 1.5
Start Time: Stop Time:
PDOP Max:

Weather Conditions: 60's, partly cloudy

LOCATION PHOTO

NORTH

CHIP RM 2, KY1840, 3S, 17APR2017

CHIP RM 2, KY1840, 3W, 17APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	17-Apr-17 - 23-Apr-17
Station Name	E 281	File Name	77354TMG041717 - 77354TMG042317

Methodology	RTK Base	X	Photo Control Point (PCP)		
	RTK VRS		LiDAR Control Point (GCP)		
	Rapid Static		LiDAR QC Point (QCP)		
			Control Station	X	Agency NGS
			LID	NA	
			Hor. Order	0	
			Ver. Order	SECOND CLASS 0	
			Designation	OTHER	

Global Coordinates

Latitude	N40°57'30.01"	Receiver :	
Longitude	W81°46'49.28"	R10	
Ellipsoidal Height	854.378 USFT	R8	X
		Other, specify	
Type of Mark	DOME IN CONCRETE	Antenna Height:	6.562 USFT
			2.000 METERS
Mark Stamping	E 281 1959		

Start Time :	17:06	Stop Time :	17:14
PDOP Max:	2.0		
Start Time :	17:26	Stop Time :	17:29
PDOP Max:	2.2		
Weather Conditions	50's-70's, partly cloudy		

LOCATION PHOTO

NORTH

E 281, KY1826, 3N, 21APR2017

E 281, KY1826, 3S, 21APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	17-Apr-17
Station Name	M 176	File Name	77354TMG041717

Methodology: RTK Base [ ] RTK VRS [X] Rapid Static [ ]

Photo Control Point (PCP) [ ]
LiDAR Control Point (GCP) [ ]
LiDAR QC Point (QCP) [ ]
Control Station [X] Agency: NGS
LID: NA
Hor. Order: 0
Ver. Order: FIRST CLASS I
Designation: OTHER

Global Coordinates

Latitude	N40°50'34.77"
Longitude	W81°45'51.72"
Ellipsoidal Height	952.908 USFT

Receiver:
R10 [X]
R8 [ ]
Other, specify [ ]

Type of Mark: DOME IN CONCRETE
Mark Stamping: M 176 1954

Antenna Height: 6.562 USFT / 2.000 METERS

Start Time: 14:40 Stop Time: 14:43
PDOP Max: 1.6
Start Time: 14:44 Stop Time: 14:47
PDOP Max: 1.8

Weather Conditions: 60's, partly cloudy

LOCATION PHOTO

NORTH

M 176, MB1317, 3E, CBN, 20APR2017

M 176, MB1317, 3W, CBN, 20APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	20-Apr-17
Station Name	N 177	File Name	77354TMG042017

Methodology: RTK Base [ ], RTK VRS [X], Rapid Static [ ]

Photo Control Point (PCP) [ ]
LiDAR Control Point (GCP) [ ]
LiDAR QC Point (QCP) [ ]
Control Station [ ] Agency: NGS
LID: NA
Hor. Order: 0
Ver. Order: FIRST CLASS I
Designation: OTHER

Global Coordinates

Latitude	N40°56'43.03"
Longitude	W81°43'01.98"
Ellipsoidal Height	849.293 USFT
Type of Mark	DOME IN CONCRETE
Mark Stamping	N 177 1954

Receiver:
R10 [X]
R8 [ ]
Other, specify [ ]

Antenna Height: 6.562 USFT / 2.000 METERS

Start Time: 8:02 Stop Time: 8:05
PDOP Max: 1.8
Start Time: Stop Time:
PDOP Max:

Weather Conditions: 60's -80's, partly cloudy

LOCATION PHOTO

NORTH

N 177, KY1710, 3E, 20APR2017

N 177, KY1710, 3W, 20APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	19-Apr-17
Station Name	N 287	File Name	77354TMG041917

Methodology: RTK Base [ ], RTK VRS [X], Rapid Static [ ]

Photo Control Point (PCP) [ ]
LiDAR Control Point (GCP) [ ]
LiDAR QC Point (QCP) [ ]
Control Station [ ] Agency: NGS
LID: NA
Hor. Order: NA
Ver. Order: SECOND CLASS 0
Designation: OTHER

Global Coordinates

Latitude	N40°53'56.20"
Longitude	W81°40'00.90"
Ellipsoidal Height	920.586 USFT

Receiver:
R10 [X]
R8 [ ]
Other, specify [ ]

Type of Mark	DOME IN CONCRETE
Mark Stamping	N 287 1959

Antenna Height: 6.562 USFT / 2.000 METERS

Start Time :	8:33	Stop Time :	8:36
PDOP Max:	2.0		
Start Time :		Stop Time :	
PDOP Max:			

Weather Conditions: 50's - 70's, cloudy, light rain

LOCATION PHOTO

NORTH

N 287, KY1900, 3E, 19APR2017

N 287, KY1900, 3W, 19APR2017

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	MWCD Chippewa SubBasin	Operator Name	T. Grams
Project Number	77354	Date of Survey	20-Apr-17
Station Name	R 176	File Name	77354TMG042017

Methodology: RTK Base [ ], RTK VRS [X], Rapid Static [ ]

Photo Control Point (PCP) [ ]
LiDAR Control Point (GCP) [ ]
LiDAR QC Point (QCP) [ ]
Control Station [X] Agency: NGS
LID: NA
Hor. Order: 0
Ver. Order: FIRST CLASS I
Designation: OTHER

Global Coordinates

Latitude	N41°00'44.74"
Longitude	W81°55'22.68"
Ellipsoidal Height	905.310 USFT

Receiver:
R10 [X]
R8 [ ]
Other, specify [ ]

Type of Mark	DOME IN CONCRETE
Mark Stamping	R 176 1954

Antenna Height: 6.562 USFT / 2.000 METERS

Start Time :	13:54	Stop Time :	13:57
PDOP Max:	1.9		
Start Time :	13:57	Stop Time :	14:00
PDOP Max:	1.7		

Weather Conditions: 60's -80's, partly cloudy

LOCATION PHOTO

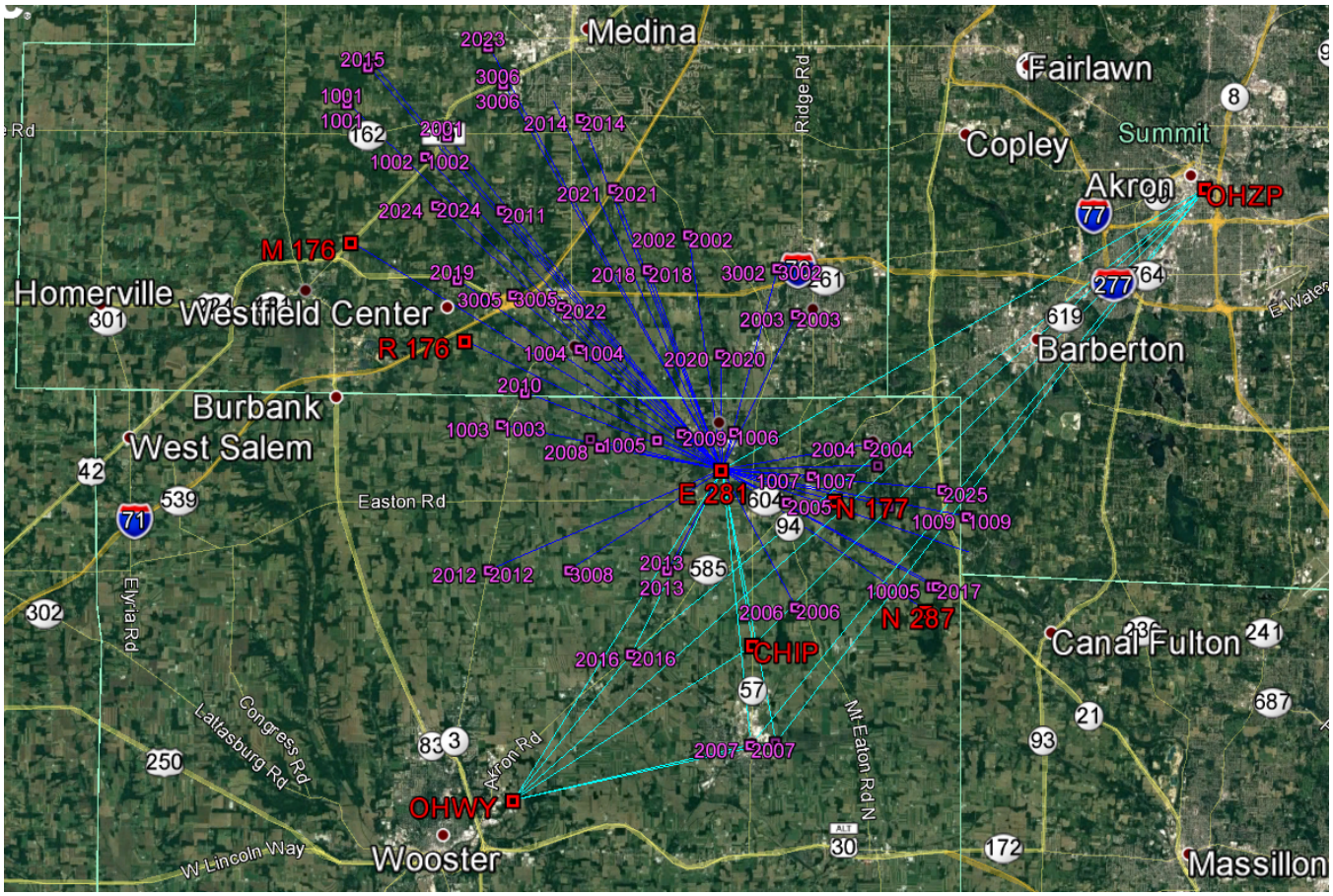
NORTH

R 176, MB1307, 3E, 20APR2017

R 176, MB1307, 3S, 20APR2017

Section 5: GPS Control Diagram

This section contains a graphical representation of the control stations used for the USGS OH Chippewa Watershed 2017 B17 LiDAR Project. The diagrams on the following pages depict the control stations used in the NAD83 (HARN) adjustment.



USGS OH Chippewa Watershed 2017 B17 LiDAR PROJECT
TASK ORDER NUMBER: G17PD00344

Horizontal Datum: NAD 83 (HARN)
Vertical Datum: NAVD 88
Units: US Survey Feet
State Plane Zone: Ohio North Zone 3401
Geoid Model: Geoid 12B
Coordinate System: Grid
Date: December 2017

N

Geodetic Control and/or Geodetic Control Check
LiDAR Quality Control Stations

NOT TO SCALE