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# **GPS SURVEY FOR LIDAR REPORT**

**FOR**

**Southeastern Wisconsin Regional Planning  
Commission  
(SEWRPC)**

**Kenosha County 2010-2011 Elevation Mapping Project**

**March 8, 2011**

**AERO-METRIC PROJECT NO. 1-091220.02**



GPS Survey for LiDAR Report

For

Southeastern Wisconsin Regional Planning Commission  
(SEWRPC)

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AERO-METRIC Project No. 1-091220.02

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**Southeastern Wisconsin Regional Planning Commission  
(SEWRPC)**

**Kenosha County 2010-2011 Elevation Mapping Project**

**GPS Survey Report for LiDAR**

**AeroMetric, INC.  
4020 Technology Parkway  
Sheboygan, WI 53083**

**AeroMetric Project No. 1-091220.02**

**Abstract**

AeroMetric, Inc. established accurate LiDAR trajectory coordinates for the Kenosha County area flown at 1100 meters above mean terrain. The information allows photogrammetrists to position the LiDAR imagery with minimal ground control and maintain the standards published by the Federal Geographic Data Committee. In conjunction with the AirBorne Global Positioning and Inertial Measuring System (ABGPS/IMU), 100 ground control points (checkpoints) were established to validate the accuracy of the LiDAR data.

Airborne GPS/IMU surveys were completed between March 31 and April 4, 2010 during the acquisition of the imagery. Ground control surveys were completed between June 30 and July 2, 2010.

**General Outline**

- GPS equipment utilized for project.

GPS measurements used Wild/Leica System 500 receivers to support the ground checkpoint surveys. The Wild/Leica System 500's are dual frequency, multi-channelled receivers.

GPS equipment used to facilitate the airborne GPS processing (i.e. that were incorporated into the ABGPS adjustment) included Trimble receivers as downloaded through the Wisconsin Department of Transportation Continuously Operating Reference Stations (WISCORS) web site.

The aircraft used two Applanix AV-510 (version VER5, s/n 2679 and s/n 2885) units to receive and track the L1 C/A-code, L1 and L2 carrier phase, and L2 P-code (or encrypted Y-code) of up to 12 GPS satellites and to record the inertial measurement unit data.

- Conditions Affecting Progress.

None.

**Horizontal and Vertical Control**

Base horizontal control for the check point surveys consisted of one NGS Order B station: **TWIN LAKES GPS**; and four NGS First Order stations: **BRIGHTON N GPS, PARIS C GPS, PLEASANT PRAIRIE E**, and **SALEM E GPS**.

Horizontal control is referenced to the Wisconsin State Plane Coordinate System – South Zone, based on the North American Datum of 1927 (NAD27). Final coordinates are published in us foot.

Base vertical control for the check point surveys consisted of four NGS Second Order, Class 1 stations: **BRIGHTON N GPS, PLEASANT PRAIRIE E, SALEM E GPS**, and **TWIN LAKES GPS**; and one NGS Fourth Order, Class 1 ellipsoid height station: **PARIS C GPS**. The NGS Geoid Model GEOID09 was applied

to the derived ellipsoid heights (modified from NGVD29 elevations) that approximate the National Geodetic Vertical Datum of 1929.

Vertical control is based on the National Geodetic Vertical Datum of 1929 (NGVD29).

Base horizontal and vertical control for the Airborne GPS surveys consisted of five WISCORS stations: **DEPE**, **KEHA**, **SHAN**, **SIWI**, and **WATH**.

NGS recovery sheets are located in Section 2 of the Control Survey Report.

### **Ground Computations**

GPS data was collected using the RTK method using the above listed control stations as the RTK bases. GPS measurement reduction was done in two stages. Initial computations were done with LEICA Geo Office (LGO), version 4.0. LGO permits the conversion of raw satellite data collected by the receivers to a meaningful coordinate difference between points (baseline solutions). Once the baseline solutions were determined, they were input into the GeoSurv-GeoLab2 series of programs (Geolab version 2.4d). Additional control points (mostly section corners) were observed and used for analysis and quality verification of the RTK surveys. Shown below are the misclosures for those control points.

#### **HORIZONTAL/VERTICAL CLOSURES (in US FOOT)**

<u>STATION</u>	<u>NORTHING</u>	<u>EASTING</u>	<u>ELEVATION</u>
E7-2-21	0.55	0.53	0.23
E23-1-20	0.06	0.19	----
C30-1-19	0.30	0.33	0.03
S5-2-20	0.32	0.39	0.03
SW5-1-23	0.17	0.27	----
BRISTOL E GPS	0.18	0.08	0.05

### **Airborne GPS/IMU Computations**

#### **Airborne GPS**

The carrier phase ambiguity resolution on the fly, without initialization, process was used to determine the airborne positions. This solution achieved a sub-decimeter kinematic position without the operational constraint of static initialization as used in semi-kinematic or stop-and-go positioning.

The processing technique used by Applanix, Inc. for achieving the desired accuracy is Kinematic Ambiguity Resolution (KAR). KAR searches for ambiguities and uses a special method to evaluate the relative quality of each intersection (RMS). A quality indicator is used to evaluate the accuracy of the solution for each processing computation. In addition to the quality indicator, the software will compute separation plots between any two solutions, which will ultimately determine the acceptance of the airborne GPS post processing.

#### **Inertial Data**

The post-processing between the inertial measuring unit (IMU) and aiding sensor data (i.e. airborne GPS post processed data) computes an optimally blended navigation solution. A Kalman filter-based aided inertial navigation algorithm generates the optimally accurate (in the sense of least-square error) navigation solution that retains the best characteristics of the processed input data. An example of inertial/GPS sensor blending is the following: inertial data is smooth in the short-term. However, a free-inertial navigation solution has errors that grow without bound with time. A GPS navigation solution exhibits short-term noise but has errors that are bounded. This optimally blended navigation solution will retain the best features of both, i.e. the blended navigation solution has errors that are smooth and bounded.

The resultant processing generates the following data:

- Position: latitude, longitude, altitude with respect to a user selectable datum
- Velocity: north, east, and down components
- 3-axis attitude: roll, pitch, true heading
- Acceleration: x, y, z components
- Angular rates: x, y, z components

These procedures are utilized for both the airborne processing and the blending of inertial and GPS processing. The software maker is Applanix, Inc. Programs utilized are POSpac (Position and Orientation System post-processing PACKAGE), POSGPS (POS Global Positioning System), POSProc (POS post-PROCESSing), and POSEO (POS Exterior Orientation), versions 4.4.

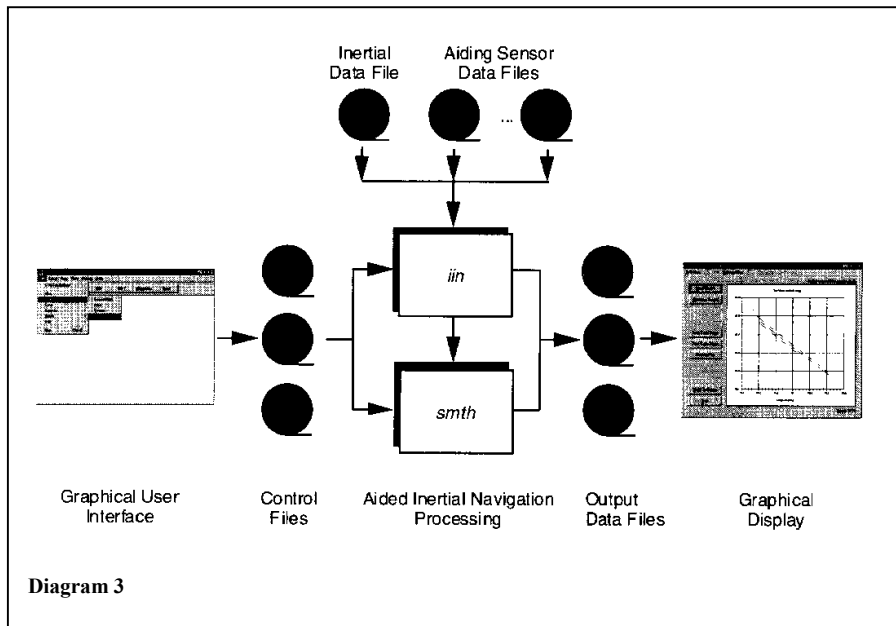
The airborne GPS and blending of inertial and GPS post-processing were completed in multiple steps.

1. A PCMCIA card reader transferred the collected aircraft raw GPS data to the main computer transferred the raw base station data. Data was saved under the project number and an airborne sub-directory. Inside the airborne sub-directory, four additional sub-directories were also created - EO, GPS, PROC, and RAW.
2. The aircraft raw data (IMU and GPS data combined) was run through a data extractor program. This separated the IMU and GPS data. In addition to the extracting of data, it provided the analyst the first statistics on the overall flight. The program was POSpac (POS post-processing PACKAGE).
3. The base station and aircraft data were converted to Applanix, PosGPS data format.
4. Executing POSGPS program to derive accurate GPS positions for all flights:  
The software utilized for the data collected was PosGPS, a kinematic on-the-fly (OTF) processing software package. Post processing of the data is computed from each base station in both a forward and backward direction. This provides the analyst the ability to Quality Check (QC) the post processing, since different ambiguities are determined from different base stations and also with the same data from different directions.

The trajectory separation program is designed to display the time of week that the airborne or roving antenna traveled, and compute the differences found between processing runs. Processed data can be compared between a forward/reverse solution from one base station, a reverse solution from one base station and a forward solution from the second base station, etc. This is ultimately the final QC check for the post-processing of the GPS data for the project. This checks the data – when two processing runs agree with each other. If wrong ambiguities were found with one or both runs, the analyst would see disagreements from the trajectory plot, and re-processing would continue until an agreement was determined.

Once the analyst accepts a forward and reverse processing solution, the trajectory plot is printed and the combined solution is stored in a file format acceptable for the IMU post processor. See Section 4 of the control report for the trajectory plot of the accepted processing solutions.

5. When the data was accepted after quality control analysis, the separation plot is printed and the combined solution is stored in a file format acceptable for the IMU post processor (i.e. POSProc).
6. Execute POSProc.



POSProc comprises a set of individual processing interface tools that execute and provide the following functions:

Diagram 3 shows the organization of these tools, and is a function of the POSProc processing components.

#### Integrated Inertial Navigation (*iin*) Module.

The name *iin* is a contraction of Integrated Inertial Navigation. *iin* reads inertial data and aiding data from data files specified in a processing environment file and computes the aided inertial navigation solution. The inertial data comes from a strapdown IMU. *iin* outputs the navigation data between start and end times at a data rate as specified in the environment file. *iin* also outputs Kalman filter data for analysis of estimation error statistics and smoother data that the smoothing program *smth* uses to improve the navigation solution accuracy.

*iin* implements a full strapdown inertial navigator that solves Newton's equation of motion on the earth using inertial data from a strapdown IMU. The inertial navigator implements coning and sculling compensation to handle potential problems caused by vibration of the IMU.

#### Smoother Module (*smth*).

*smth* is a companion processing module to *iin*. *smth* is comprised of two individual functions that run in sequence. *smth* first runs the *smoother function* and then runs the *navigation correction function*.

The *smth* smoother function performs backwards-in-time processing of the forwards-in-time blended navigation solution and Kalman filter data generated by *iin* to compute smoothed error estimates. *smth* implements a modified Bryson-Frazier smoothing algorithm specifically designed for use with the *iin* Kalman filter. The resulting smoothed strapdown navigator error estimates at a given time point are the optimal estimates based on all input data before and after the given time point. In this sense, *smth* makes use of all available information in the input data. *smth* writes the smoothed error estimates and their RMS estimation errors to output data files.

The *smth* navigation correction function implements a feedforward error correction

mechanism similar to that in the *iin* strapdown navigation solution using the smoothed strapdown navigation errors. *smth* reads in the smoothed error estimates and with these, corrects the strapdown navigation data. The resulting navigation solution is called a Best Estimate of Trajectory (BET), and is the best obtainable estimate of vehicle trajectory with the available inertial and aiding sensor data.

The above-mentioned modules provide the analyst the following statistics to ensure that the most optimal solution was achieved: a log of the *iin* processing, the Kalman filter Measurement Residuals, Smoothed RMS Estimation Errors, and Smoothed Sensor Errors and RMS.

The Best Estimate of Trajectory output file is the final product of the airborne GPS/IMU processing and is used as input into the LiDAR point cloud processing.

### **LiDAR Statistics**

Statistics pertaining to the analysis and accuracy of the LiDAR points are as follows:

- 1) 1100 meters above mean terrain was the flying height.
- 2) 2 foot nominal ground point spacing as tested.
- 3) Side to side scan width was a nominal 34 degrees
- 4) 100 total checkpoints spread throughout the area were used to validate the LiDAR elevation.
- 5) Checkpoints were divided into 5 classes of surfaces.
- 5) The vertical Root Mean Square (RMS) error found from the 5 surface classes:

Hard surface	= 0.16 feet
Short grass	= 0.18 feet
Tall grass	= 0.21 feet
Brush	= 0.25 feet
Trees	= 0.23 feet

### **Comments**

If you should have any questions about the Survey Control Report provided please contact:

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(920) 457-3631  
[rmerry@aerometric.com](mailto:rmerry@aerometric.com)



## The NGS Data Sheet

See file [dsdata.txt](#) for more information about the datasheet.

```

DATABASE = ,PROGRAM = datasheet, VERSION = 7.85
1 National Geodetic Survey, Retrieval Date = MARCH 8, 2011
DF9477 *****
DF9477 DESIGNATION - BRIGHTON N GPS
DF9477 PID - DF9477
DF9477 STATE/COUNTY- WI/KENOSHA
DF9477 USGS QUAD - ROCHESTER (1976)
DF9477
DF9477 *CURRENT SURVEY CONTROL
DF9477
DF9477* NAD 83(2007)- 42 39 18.60965(N) 088 09 46.60058(W) ADJUSTED
DF9477* NAVD 88 - 241.138 (meters) 791.13 (feet) ADJUSTED
DF9477
DF9477 EPOCH DATE - 2002.00
DF9477 X - 150,609.280 (meters) COMP
DF9477 Y - -4,695,731.515 (meters) COMP
DF9477 Z - 4,299,547.385 (meters) COMP
DF9477 LAPLACE CORR- -1.83 (seconds) DEFLECO9
DF9477 ELLIP HEIGHT- 206.698 (meters) (02/10/07) ADJUSTED
DF9477 GEOID HEIGHT- -34.44 (meters) GEOID09
DF9477 DYNAMIC HT - 241.065 (meters) 790.89 (feet) COMP
DF9477
DF9477 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----
DF9477 Type PID Designation North East Ellip
DF9477 -----
DF9477 NETWORK DF9477 BRIGHTON N GPS 0.29 0.22 0.37
DF9477 -----
DF9477 MODELED GRAV- 980,313.0 (mgal) NAVD 88
DF9477
DF9477 VERT ORDER - SECOND CLASS I
DF9477
DF9477.The horizontal coordinates were established by GPS observations
DF9477.and adjusted by the National Geodetic Survey in February 2007.
DF9477
DF9477.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
DF9477.See National Readjustment for more information.
DF9477.The horizontal coordinates are valid at the epoch date displayed above.
DF9477.The epoch date for horizontal control is a decimal equivalence
DF9477.of Year/Month/Day.
DF9477
DF9477.The orthometric height was determined by differential leveling and
DF9477.adjusted in April 2007.
DF9477
DF9477.Photographs are available for this station.
DF9477
DF9477.The X, Y, and Z were computed from the position and the ellipsoidal ht.
DF9477

```

DF9477.The Laplace correction was computed from DEFLEC09 derived deflections.

DF9477

DF9477.The ellipsoidal height was determined by GPS observations

DF9477.and is referenced to NAD 83.

DF9477

DF9477.The geoid height was determined by GEOID09.

DF9477

DF9477.The dynamic height is computed by dividing the NAVD 88

DF9477.geopotential number by the normal gravity value computed on the

DF9477.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45

DF9477.degrees latitude (g = 980.6199 gals.).

DF9477

DF9477.The modeled gravity was interpolated from observed gravity values.

DF9477

DF9477;

	North	East	Units	Scale	Factor	Converg.
DF9477;SPC WI S	- 74,443.298	750,620.542	MT	1.00001668	+1 15 44.1	
DF9477;SPC WI S	- 244,236.05	2,462,660.89	sFT	1.00001668	+1 15 44.1	
DF9477;UTM 16	- 4,723,178.605	404,681.409	MT	0.99971178	-0 47 17.0	

DF9477

DF9477! - Elev Factor x Scale Factor = Combined Factor

DF9477!SPC WI S - 0.99996758 x 1.00001668 = 0.99998426

DF9477!UTM 16 - 0.99996758 x 0.99971178 = 0.99967937

DF9477

DF9477

#### SUPERSEDED SURVEY CONTROL

DF9477

DF9477 NAD 83(1997)- 42 39 18.60982(N) 088 09 46.60071(W) AD( ) 1

DF9477 ELLIP H (04/02/04) 206.709 (m) GP( ) 4 1

DF9477 NAVD 88 (02/25/04) 241.159 (m) 791.20 (f) UNKNOWN 2 1

DF9477

DF9477.Superseded values are not recommended for survey control.

DF9477.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

DF9477.[See file dsdata.txt](#) to determine how the superseded data were derived.

DF9477

DF9477\_U.S. NATIONAL GRID SPATIAL ADDRESS: 16TDN0468123178 (NAD 83)

DF9477\_MARKER: DD = SURVEY DISK

DF9477\_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT

DF9477\_STAMPING: BRIGHTON N GPS 2002

DF9477\_MARK LOGO: WIDT

DF9477\_PROJECTION: FLUSH

DF9477\_MAGNETIC: R = STEEL ROD IMBEDDED IN MONUMENT

DF9477\_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL

DF9477\_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

DF9477+SATELLITE: SATELLITE OBSERVATIONS - November 01, 2010

DF9477

HISTORY	Date	Condition	Report By
DF9477	- 2001	MONUMENTED	WIDT
DF9477	- 20080610	GOOD	WIDT
DF9477	- 20101101	GOOD	JCLS

DF9477

DF9477

#### STATION DESCRIPTION

DF9477

DF9477'DESCRIBED BY WI DEPT OF TRANSP 2001 (DJH)

DF9477'THE STATION IS LOCATED ABOUT 13 KM SOUTHEAST OF WATERFORD, 10 KM

DF9477'SOUTHWEST OF UNION GROVE, AND 10 KM EAST-SOUTHEAST OF BURLINGTON.

DF9477'OWNERSHIP--KENOSHA COUNTY. TO REACH THE STATION FROM THE JUNCTION OF

DF9477'STATE HIGHWAY 11 (DURAND AVENUE) WITH STATE HIGHWAY 75 (BEAUMONT

DF9477'AVENUE) IN THE COMMUNITY OF KANSASVILLE, GO SOUTH ON STATE HIGHWAY 75

3/8/2011

DATASHEETS

DF9477'(BEAUMONT AVENUE) FOR 3.7 KM TO COUNTY HIGHWAY BB (7TH STREET), TURN  
DF9477'RIGHT AND GO WEST ON COUNTY HIGHWAY BB (7TH STREET) FOR 3.8 KM TO  
DF9477'COUNTY HIGHWAY B (288TH AVENUE), CONTINUE WEST ON COUNTY HIGHWAY BB  
DF9477'(7TH STREET) FOR 0.3 KM TO THE STATION ON THE LEFT. THE STATION IS A  
DF9477'BRONZE WISCONSIN DEPARTMENT OF TRANSPORTATION GEODETIC SURVEY CONTROL  
DF9477'STATION DISK SET IN THE TOP OF A 41-CM DIAMETER CONCRETE POST SET TO  
DF9477'A DEPTH OF 2.4 M AND ABOUT 1 M BELOW THE HIGHWAY PAVEMENT. THE  
DF9477'STATION IS 7.6 M SOUTH OF THE CENTERLINE OF COUNTY HIGHWAY BB (7TH  
DF9477'AVENUE), 22.1 M SOUTHWEST OF POWER POLE --00-21924--, 15.7 M EAST OF  
DF9477'A WOOD POST FOR A --STOP AHEAD-- SIGN, AND 2 M NORTH OF A CULTIVATED  
DF9477'FIELD. ---NOTE---THE STATION IS SOUTHWEST, SOUTHEAST AND NORTH OF  
DF9477'THREE ORANGE 4X4 PLASTIC WITNESS POSTS. ---NOTE2---THIS STATION HAS  
DF9477'NO VISIBLE OBSTRUCTIONS EXTENDING HIGHER THAN 15 DEGREES ABOVE THE  
DF9477'HORIZON.

DF9477

DF9477

STATION RECOVERY (2008)

DF9477

DF9477'RECOVERY NOTE BY WI DEPT OF TRANSP 2008 (MAB)  
DF9477'RECOVERED IN GOOD CONDITION. REPLACED TWO BROKEN GUARD POSTS. THE  
DF9477'STATION IS 1.0 M NORTH, 1.0 M SOUTHEAST, AND 1.0 M SOUTHWEST OF THREE  
DF9477'4X4 ORANGE PLASTIC GUARD POSTS.

DF9477

DF9477

STATION RECOVERY (2010)

DF9477

DF9477'RECOVERY NOTE BY JOHN CHANCE LAND SURVEYS INC 2010  
DF9477'RECOVERED IN GOOD CONDITION.

\*\*\* retrieval complete.

Elapsed Time = 00:00:00

## The NGS Data Sheet

See file [dsdata.txt](#) for more information about the datasheet.

```

DATABASE = ,PROGRAM = datasheet, VERSION = 7.85
1 National Geodetic Survey, Retrieval Date = MARCH 8, 2011
DF9453 *****
DF9453 DESIGNATION - BRISTOL E GPS
DF9453 PID - DF9453
DF9453 STATE/COUNTY- WI/KENOSHA
DF9453 USGS QUAD - PADDOCK LAKE (1976)
DF9453
DF9453 *CURRENT SURVEY CONTROL
DF9453
DF9453* NAD 83(2007)- 42 32 17.69001(N) 088 00 01.60256(W) ADJUSTED
DF9453* NAVD 88 - 211.554 (meters) 694.07 (feet) ADJUSTED
DF9453
DF9453 EPOCH DATE - 2002.00
DF9453 X - 164,232.435 (meters) COMP
DF9453 Y - -4,704,049.487 (meters) COMP
DF9453 Z - 4,289,965.895 (meters) COMP
DF9453 LAPLACE CORR- -1.76 (seconds) DEFLECO9
DF9453 ELLIP HEIGHT- 177.055 (meters) (02/10/07) ADJUSTED
DF9453 GEOID HEIGHT- -34.49 (meters) GEOID09
DF9453 DYNAMIC HT - 211.487 (meters) 693.85 (feet) COMP
DF9453
DF9453 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----
DF9453 Type PID Designation North East Ellip
DF9453 -----
DF9453 NETWORK DF9453 BRISTOL E GPS 0.35 0.25 0.47
DF9453 -----
DF9453 MODELED GRAV- 980,301.2 (mgal) NAVD 88
DF9453
DF9453 VERT ORDER - SECOND CLASS I
DF9453
DF9453.The horizontal coordinates were established by GPS observations
DF9453.and adjusted by the National Geodetic Survey in February 2007.
DF9453
DF9453.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
DF9453.See National Readjustment for more information.
DF9453.The horizontal coordinates are valid at the epoch date displayed above.
DF9453.The epoch date for horizontal control is a decimal equivalence
DF9453.of Year/Month/Day.
DF9453
DF9453.The orthometric height was determined by differential leveling and
DF9453.adjusted in April 2007.
DF9453
DF9453.Photographs are available for this station.
DF9453
DF9453.The X, Y, and Z were computed from the position and the ellipsoidal ht.
DF9453

```

DF9453.The Laplace correction was computed from DEFLEC09 derived deflections.  
 DF9453  
 DF9453.The ellipsoidal height was determined by GPS observations  
 DF9453.and is referenced to NAD 83.  
 DF9453  
 DF9453.The geoid height was determined by GEOID09.  
 DF9453  
 DF9453.The dynamic height is computed by dividing the NAVD 88  
 DF9453.geopotential number by the normal gravity value computed on the  
 DF9453.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45  
 DF9453.degrees latitude (g = 980.6199 gals.).  
 DF9453  
 DF9453.The modeled gravity was interpolated from observed gravity values.  
 DF9453

DF9453;		North	East	Units	Scale	Factor	Converg.
DF9453;SPC WI S	-	61,764.854	764,252.881	MT	1.00004504		+1 22 26.0
DF9453;SPC WI S	-	202,640.19	2,507,386.33	sFT	1.00004504		+1 22 26.0
DF9453;UTM 16	-	4,710,024.949	417,847.042	MT	0.99968304		-0 40 35.1
DF9453!	-	Elev Factor	x	Scale Factor	=	Combined Factor	
DF9453!SPC WI S	-	0.99997223	x	1.00004504	=	1.00001727	
DF9453!UTM 16	-	0.99997223	x	0.99968304	=	0.99965528	

SUPERSEDED SURVEY CONTROL

DF9453 NAD 83(1997)- 42 32 17.69024(N) 088 00 01.60269(W) AD( ) 1  
 DF9453 ELLIP H (04/02/04) 177.070 (m) GP( ) 4 1  
 DF9453 NAVD 88 (02/25/04) 211.576 (m) 694.15 (f) UNKNOWN 2 1  
 DF9453

DF9453.Superseded values are not recommended for survey control.  
 DF9453.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.  
 DF9453.[See file dsdata.txt](#) to determine how the superseded data were derived.  
 DF9453

DF9453\_U.S. NATIONAL GRID SPATIAL ADDRESS: 16TDN1784710024 (NAD 83)  
 DF9453\_MARKER: DD = SURVEY DISK  
 DF9453\_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT  
 DF9453\_STAMPING: BRISTOL E GPS 2002  
 DF9453\_MARK LOGO: WIDT  
 DF9453\_PROJECTION: FLUSH  
 DF9453\_MAGNETIC: R = STEEL ROD IMBEDDED IN MONUMENT  
 DF9453\_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL  
 DF9453\_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR  
 DF9453+SATELLITE: SATELLITE OBSERVATIONS - March 22, 2009  
 DF9453

DF9453	HISTORY	- Date	Condition	Report By
DF9453	HISTORY	- 2001	MONUMENTED	WIDT
DF9453	HISTORY	- 20060724	GOOD	WIDT
DF9453	HISTORY	- 20090322	GOOD	INDIV

STATION DESCRIPTION

DF9453'DESCRIBED BY WI DEPT OF TRANSP 2001 (DJH)  
 DF9453'THE STATION IS LOCATED ABOUT 28 KM SOUTHWEST OF RACINE, 16 KM  
 DF9453'WEST-SOUTHWEST OF KENOSHA, AND 6 KM SOUTHEAST OF BRISTOL.  
 DF9453'OWNERSHIP--KENOSHA COUNTY. TO REACH THE STATION FROM THE JUNCTION OF  
 DF9453'INTERSTATE HIGHWAY 94 WITH COUNTY HIGHWAY C (EXIT 345) ABOUT 9 KM  
 DF9453'SOUTHWEST OF THE CITY OF KENOSHA, GO WEST ON COUNTY HIGHWAY C FOR 4.0

3/8/2011

DATASHEETS

DF9453'KM TO COUNTY HIGHWAY MB AND THE STATION ON THE LEFT. THE STATION IS A  
DF9453'BRONZE WISCONSIN DEPARTMENT OF TRANSPORTATION GEODETIC SURVEY CONTROL  
DF9453'STATION DISK SET IN THE TOP OF A 41-CM DIAMETER CONCRETE POST SET TO  
DF9453'A DEPTH OF 2.4 M AND ABOUT LEVEL WITH THE HIGHWAY PAVEMENT. THE  
DF9453'STATION IS 38.1 M SOUTH OF THE CENTERLINE OF COUNTY HIGHWAY C, 38.4 M  
DF9453'SOUTHEAST OF POWER POLE --49-3952--, 32.8 M EAST OF THE CENTERLINE OF  
DF9453'COUNTY HIGHWAY MB, 2 M NORTH OF A CULTIVATED FIELD, AND 1.2 M  
DF9453'NORTHWEST OF A STEEL --R/W-- POST. ---NOTE---THE STATION IS WEST,  
DF9453'NORTHEAST AND SOUTHEAST OF THREE ORANGE 4X4 PLASTIC WITNESS POSTS.  
DF9453'---NOTE2---THIS STATION HAS NO VISIBLE OBSTRUCTIONS EXTENDING HIGHER  
DF9453'THAN 20 DEGREES ABOVE THE HORIZON.

DF9453

DF9453

STATION RECOVERY (2006)

DF9453

DF9453'RECOVERY NOTE BY WI DEPT OF TRANSP 2006 (DRB)

DF9453'RECOVERED IN GOOD CONDITION. NOTE-- THE STATION IS IN THE SOUTHEAST  
DF9453'QUADRANT OF THE JUNCTION OF COUNTY HIGHWAY C (93RD STREET) WITH COUNTY  
DF9453'HIGHWAY MB (160TH AVENUE).

DF9453

DF9453

STATION RECOVERY (2009)

DF9453

DF9453'RECOVERY NOTE BY INDIVIDUAL CONTRIBUTORS 2009

DF9453'RECOVERED IN GOOD CONDITION.

\*\*\* retrieval complete.

Elapsed Time = 00:00:01

# The NGS Data Sheet

See file [dsdata.txt](#) for more information about the datasheet.

```

DATABASE = ,PROGRAM = datasheet, VERSION = 7.85
1 National Geodetic Survey, Retrieval Date = MARCH 8, 2011
DG4944 *****
DG4944 HT_MOD - This is a Height Modernization Survey Station.
DG4944 DESIGNATION - PARIS C GPS
DG4944 PID - DG4944
DG4944 STATE/COUNTY- WI/KENOSHA
DG4944 USGS QUAD - UNION GROVE (1971)
DG4944
DG4944 *CURRENT SURVEY CONTROL
DG4944
DG4944* NAD 83(2007)- 42 38 12.99612(N) 088 01 38.61960(W) ADJUSTED
DG4944* NAVD 88 - 219.94 (meters) 721.6 (feet) GPS OBS
DG4944
DG4944 EPOCH DATE - 2002.00
DG4944 X - 161,764.679 (meters) COMP
DG4944 Y - -4,696,717.259 (meters) COMP
DG4944 Z - 4,298,043.666 (meters) COMP
DG4944 LAPLACE CORR- -2.29 (seconds) DEFLEC09
DG4944 ELLIP HEIGHT- 185.387 (meters) (02/10/07) ADJUSTED
DG4944 GEOID HEIGHT- -34.55 (meters) GEOID09
DG4944
DG4944 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----
DG4944 Type PID Designation North East Ellip
DG4944 -----
DG4944 NETWORK DG4944 PARIS C GPS 0.39 0.29 0.53
DG4944 -----
DG4944
DG4944.The horizontal coordinates were established by GPS observations
DG4944.and adjusted by the National Geodetic Survey in February 2007.
DG4944
DG4944.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
DG4944.See National Readjustment for more information.
DG4944.The horizontal coordinates are valid at the epoch date displayed above.
DG4944.The epoch date for horizontal control is a decimal equivalence
DG4944.of Year/Month/Day.
DG4944
DG4944.The orthometric height was determined by GPS observations and a
DG4944.high-resolution geoid model using precise GPS observation and
DG4944.processing techniques.
DG4944
DG4944.Photographs are available for this station.
DG4944
DG4944.The X, Y, and Z were computed from the position and the ellipsoidal ht.
DG4944
DG4944.The Laplace correction was computed from DEFLEC09 derived deflections.
DG4944
    
```

DG4944.The ellipsoidal height was determined by GPS observations  
DG4944.and is referenced to NAD 83.

DG4944

DG4944.The geoid height was determined by GEOID09.

DG4944

DG4944;		North	East	Units	Scale	Factor	Converg.
DG4944;SPC WI S	-	72,673.051	761,780.225	MT	1.00002083		+1 21 19.4
DG4944;SPC WI S	-	238,428.17	2,499,273.95	sFT	1.00002083		+1 21 19.4
DG4944;UTM 16	-	4,721,010.827	415,767.053	MT	0.99968729		-0 41 45.4

DG4944

DG4944!		Elev Factor	x	Scale Factor	=	Combined Factor
DG4944!SPC WI S	-	0.99997093	x	1.00002083	=	0.99999176
DG4944!UTM 16	-	0.99997093	x	0.99968729	=	0.99965823

DG4944

DG4944

SUPERSEDED SURVEY CONTROL

DG4944

DG4944 NAD 83(1997)- 42 38 12.99633(N) 088 01 38.61974(W) AD( ) 1  
 DG4944 ELLIP H (04/02/04) 185.401 (m) GP( ) 4 1

DG4944

DG4944.Superseded values are not recommended for survey control.  
 DG4944.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.  
 DG4944.[See file dsdata.txt](#) to determine how the superseded data were derived.

DG4944

DG4944\_U.S. NATIONAL GRID SPATIAL ADDRESS: 16TDN1576721010(NAD 83)

DG4944\_MARKER: DD = SURVEY DISK

DG4944\_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT

DG4944\_STAMPING: PARIS C GPS 2002

DG4944\_MARK LOGO: WIDT

DG4944\_PROJECTION: FLUSH

DG4944\_MAGNETIC: R = STEEL ROD IMBEDDED IN MONUMENT

DG4944\_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL

DG4944\_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

DG4944+SATELLITE: SATELLITE OBSERVATIONS - July 12, 2006

DG4944

DG4944	HISTORY	- Date	Condition	Report By
DG4944	HISTORY	- 2001	MONUMENTED	WIDT
DG4944	HISTORY	- 20060712	GOOD	WIDT

DG4944

DG4944

STATION DESCRIPTION

DG4944

DG4944'DESCRIBED BY WI DEPT OF TRANSP 2001 (DJH)  
 DG4944'THE STATION IS LOATED ABOUT 18 KM WEST-NORTHWEST OF KENOSHA, 12 KM  
 DG4944'WEST OF SOMERS AND 9 KM SOUTHEAST OF UNION GROVE. TO REACH THE  
 DG4944'STATION FROM THE JUNCTION OF US HIGHWAY 45 WITH STATE HIGHWAY 142  
 DG4944'ABOUT 21 KM WEST OF KENOSHA, GO EAST ON STATE HIGHWAY 142 FOR 2 KM TO  
 DG4944'COUNTY HIGHWAY A ON THE LEFT, TURN LEFT AND GO NORTH ON COUNTY HIGHWAY  
 DG4944'A FOR 0.6 KM TO THE STATION ON THE LEFT. THE STATION IS A BRONZE  
 DG4944'WISCONSIN DEPARTMENT OF TRANSPORTATION GEODETIC SURVEY CONTROL STATION  
 DG4944'DISK SET IN THE TOP OF A 41-CM DIAMETER CONCRETE POST SET TO A DEPTH  
 DG4944'OF 2.1 M AND ABOUT LEVEL WITH THE HIGHWAY PAVEMENT. THE STATION IS 8  
 DG4944'M WEST OF THE CENTERLINE OF COUNTY HIGHWAY A, 0.3 KM NORTH OF A WOOD  
 DG4944'POST FOR A --STOP AHEAD-- SIGN, 71 M SOUTH OF A WOOD POST MARKING FOR  
 DG4944'A CULVERT, AND 1 M WEST OF CULTIVATED FIELD. ---NOTE---THE STATION IS  
 DG4944'NORTH, SOUTH AND WEST OF AN ORANGE 4X4 PLASTIC WITNESS POST.  
 DG4944'---NOTE2---THIS STATION HAS NO VISIBLE OBSTRUCTIONS EXTENDING HIGHER  
 DG4944'THAN 15 DEGREES ABOVE THE HORIZON.  
 DG4944'



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DG4944'

DG4944

DG4944

STATION RECOVERY (2006)

DG4944

DG4944'RECOVERY NOTE BY WI DEPT OF TRANSP 2006 (DRB)

DG4944'RECOVERED IN GOOD CONDITION. NOTE-- US HIGHWAY 45 IS ALSO 200TH

DG4944'AVENUE AND STATE HIGHWAY 142 IS ALSO BURLINGTON ROAD.

\*\*\* retrieval complete.

Elapsed Time = 00:00:00

# The NGS Data Sheet

See file [dsdata.txt](#) for more information about the datasheet.

```

DATABASE = ,PROGRAM = datasheet, VERSION = 7.85
1 National Geodetic Survey, Retrieval Date = MARCH 8, 2011
DF9474 *****
DF9474 DESIGNATION - PLEASANT PRAIRIE E
DF9474 PID - DF9474
DF9474 STATE/COUNTY- WI/KENOSHA
DF9474 USGS QUAD - KENOSHA (1994)
DF9474
DF9474 *CURRENT SURVEY CONTROL
DF9474
DF9474* NAD 83(2007)- 42 33 37.38869(N) 087 48 45.13764(W) ADJUSTED
DF9474* NAVD 88 - 180.633 (meters) 592.63 (feet) ADJUSTED
DF9474
DF9474 EPOCH DATE - 2002.00
DF9474 X - 179,594.550 (meters) COMP
DF9474 Y - -4,701,800.905 (meters) COMP
DF9474 Z - 4,291,756.663 (meters) COMP
DF9474 LAPLACE CORR- -1.56 (seconds) DEFLECO9
DF9474 ELLIP HEIGHT- 146.023 (meters) (02/10/07) ADJUSTED
DF9474 GEOID HEIGHT- -34.62 (meters) GEOID09
DF9474 DYNAMIC HT - 180.579 (meters) 592.45 (feet) COMP
DF9474
DF9474 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----
DF9474 Type PID Designation North East Ellip
DF9474 -----
DF9474 NETWORK DF9474 PLEASANT PRAIRIE E 0.37 0.29 0.51
DF9474 -----
DF9474 MODELED GRAV- 980,317.0 (mgal) NAVD 88
DF9474
DF9474 VERT ORDER - SECOND CLASS I
DF9474
DF9474.The horizontal coordinates were established by GPS observations
DF9474.and adjusted by the National Geodetic Survey in February 2007.
DF9474
DF9474.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
DF9474.See National Readjustment for more information.
DF9474.The horizontal coordinates are valid at the epoch date displayed above.
DF9474.The epoch date for horizontal control is a decimal equivalence
DF9474.of Year/Month/Day.
DF9474
DF9474.The orthometric height was determined by differential leveling and
DF9474.adjusted in April 2007.
DF9474
DF9474.Photographs are available for this station.
DF9474
DF9474.The X, Y, and Z were computed from the position and the ellipsoidal ht.
DF9474

```

DF9474.The Laplace correction was computed from DEFLEC09 derived deflections.

DF9474

DF9474.The ellipsoidal height was determined by GPS observations

DF9474.and is referenced to NAD 83.

DF9474

DF9474.The geoid height was determined by GEOID09.

DF9474

DF9474.The dynamic height is computed by dividing the NAVD 88

DF9474.geopotential number by the normal gravity value computed on the

DF9474.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45

DF9474.degrees latitude (g = 980.6199 gals.).

DF9474

DF9474.The modeled gravity was interpolated from observed gravity values.

DF9474

DF9474;

	North	East	Units	Scale	Factor	Converg.
DF9474;SPC WI S	- 64,610.865	779,620.548	MT	1.00003936	+1 30	10.8
DF9474;SPC WI S	- 211,977.48	2,557,805.08	sFT	1.00003936	+1 30	10.8
DF9474;UTM 16	- 4,712,318.158	433,300.960	MT	0.99965473	-0 32	58.5

DF9474

DF9474! - Elev Factor x Scale Factor = Combined Factor

DF9474!SPC WI S - 0.99997710 x 1.00003936 = 1.00001646

DF9474!UTM 16 - 0.99997710 x 0.99965473 = 0.99963184

DF9474

DF9474

#### SUPERSEDED SURVEY CONTROL

DF9474

DF9474 NAD 83(1997)- 42 33 37.38894(N) 087 48 45.13780(W) AD( ) 1

DF9474 ELLIP H (04/02/04) 146.040 (m) GP( ) 4 1

DF9474 NAVD 88 (02/25/04) 180.655 (m) 592.70 (f) UNKNOWN 2 1

DF9474

DF9474.Superseded values are not recommended for survey control.

DF9474.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

DF9474.[See file dsdata.txt](#) to determine how the superseded data were derived.

DF9474

DF9474\_U.S. NATIONAL GRID SPATIAL ADDRESS: 16TDN3330012318 (NAD 83)

DF9474\_MARKER: DD = SURVEY DISK

DF9474\_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT

DF9474\_STAMPING: PLEASANT PRAIRIE E 2002

DF9474\_MARK LOGO: WIDT

DF9474\_PROJECTION: FLUSH

DF9474\_MAGNETIC: R = STEEL ROD IMBEDDED IN MONUMENT

DF9474\_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL

DF9474\_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

DF9474+SATELLITE: SATELLITE OBSERVATIONS - March 25, 2009

DF9474

HISTORY	Date	Condition	Report By
DF9474 HISTORY	- 2001	MONUMENTED	WIDT
DF9474 HISTORY	- 20060724	GOOD	WIDT
DF9474 HISTORY	- 20090325	GOOD	INDIV

DF9474

DF9474

#### STATION DESCRIPTION

DF9474

DF9474'DESCRIBED BY WI DEPT OF TRANSP 2001 (DJH)

DF9474'THE STATION IS LOCATED IN KENOSHA. OWNERSHIP--KENOSHA COUNTY. TO

DF9474'REACH THE STATION FROM THE JUNCTION OF STATE HIGHWAY 32 (SHERIDAN

DF9474'ROAD) WITH STATE HIGHWAY 50 IN THE CITY OF KENOSHA, GO SOUTH ON STATE

DF9474'HIGHWAY 32 (SHERIDAN ROAD) FOR 1.3 KM TO 75TH STREET, TURN LEFT AND

DF9474'GO EAST ON 75TH STREET FOR 0.8 KM TO 3RD AVENUE ON THE RIGHT, TURN

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DF9474'RIGHT AND GO SOUTH ON 3RD AVENUE FOR 0.4 KM TO --KENOSHA PARK SYSTEM  
DF9474'SOUTHPORT PARK--, CONTINUE SOUTHEAST PASSING --KENOSHA WATER UTILITY  
DF9474'WASTEWATER DIVISION-- FOR 0.3 KM TO THE SOUTH PARKING LOT AND THE  
DF9474'STATION ON THE LEFT. THE STATION IS A BRONZE WISCONSIN DEPARTMENT OF  
DF9474'TRANSPORTATION GEODETIC SURVEY CONTROL STATION DISK SET IN THE TOP OF  
DF9474'A 41-CM DIAMETER CONCRETE POST SET TO A DEPTH OF 2.4 M AND ABOUT  
DF9474'LEVEL WITH THE PARKING LOT PAVEMENT. THE STATION IS 45.2 M SOUTHEAST  
DF9474'OF A LIGHT POLE, 15.3 M NORTHWEST OF METAL POST FOR A --DANGER NO  
DF9474'TRESPASSING-- SIGN, AND 3.1 M EAST OF THE EAST EDGE OF A PARKING LOT  
DF9474'PAVEMENT. ---NOTE---THE STATION IS 0.2 M EAST OF A WHITE PLASTIC  
DF9474'WITNESS POST. ---NOTE2---THIS STATION HAS NO VISIBLE OBSTRUCTIONS  
DF9474'EXTENDING HIGHER THAN 15 DEGREES ABOVE THE HORIZON.

DF9474

DF9474

STATION RECOVERY (2006)

DF9474

DF9474'RECOVERY NOTE BY WI DEPT OF TRANSP 2006 (DRB)

DF9474'RECOVERED IN GOOD CONDITION. ADD-- THE STATION IS 14.3 M NORTH OF THE  
DF9474'EXTENDED CENTERLINE OF THE FIRST DESTROYED DOCK EXTENDING EAST INTO  
DF9474'LAKE MICHIGAN SOUTH OF THE SAND BEACH. NOTE-- THERE IS NO WHITE  
DF9474'PLASTIC WITNESS POST AND NO --DANGER NO TRESPASSING-- SIGN PRESENT.

DF9474

DF9474

STATION RECOVERY (2009)

DF9474

DF9474'RECOVERY NOTE BY INDIVIDUAL CONTRIBUTORS 2009

DF9474'RECOVERED IN GOOD CONDITION.

\*\*\* retrieval complete.

Elapsed Time = 00:00:01

# The NGS Data Sheet

See file [dsdata.txt](#) for more information about the datasheet.

```

DATABASE = ,PROGRAM = datasheet, VERSION = 7.85
1 National Geodetic Survey, Retrieval Date = MARCH 8, 2011
DF9456 *****
DF9456 DESIGNATION - SALEM E GPS
DF9456 PID - DF9456
DF9456 STATE/COUNTY- WI/KENOSHA
DF9456 USGS QUAD - PADDOCK LAKE (1976)
DF9456
DF9456 *CURRENT SURVEY CONTROL
DF9456
DF9456* NAD 83(2007)- 42 31 55.64373(N) 088 04 50.51757(W) ADJUSTED
DF9456* NAVD 88 - 261.248 (meters) 857.11 (feet) ADJUSTED
DF9456
DF9456 EPOCH DATE - 2002.00
DF9456 X - 157,659.948 (meters) COMP
DF9456 Y - -4,704,771.215 (meters) COMP
DF9456 Z - 4,289,498.257 (meters) COMP
DF9456 LAPLACE CORR- -2.01 (seconds) DEFLECO9
DF9456 ELLIP HEIGHT- 226.824 (meters) (02/10/07) ADJUSTED
DF9456 GEOID HEIGHT- -34.42 (meters) GEOID09
DF9456 DYNAMIC HT - 261.166 (meters) 856.84 (feet) COMP
DF9456
DF9456 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----
DF9456 Type PID Designation North East Ellip
DF9456 -----
DF9456 NETWORK DF9456 SALEM E GPS 0.35 0.27 0.47
DF9456 -----
DF9456 MODELED GRAV- 980,297.7 (mgal) NAVD 88
DF9456
DF9456 VERT ORDER - SECOND CLASS I
DF9456
DF9456.The horizontal coordinates were established by GPS observations
DF9456.and adjusted by the National Geodetic Survey in February 2007.
DF9456
DF9456.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
DF9456.See National Readjustment for more information.
DF9456.The horizontal coordinates are valid at the epoch date displayed above.
DF9456.The epoch date for horizontal control is a decimal equivalence
DF9456.of Year/Month/Day.
DF9456
DF9456.The orthometric height was determined by differential leveling and
DF9456.adjusted in April 2007.
DF9456
DF9456.Photographs are available for this station.
DF9456
DF9456.The X, Y, and Z were computed from the position and the ellipsoidal ht.
DF9456

```

DF9456.The Laplace correction was computed from DEFLEC09 derived deflections.

DF9456

DF9456.The ellipsoidal height was determined by GPS observations

DF9456.and is referenced to NAD 83.

DF9456

DF9456.The geoid height was determined by GEOID09.

DF9456

DF9456.The dynamic height is computed by dividing the NAVD 88

DF9456.geopotential number by the normal gravity value computed on the

DF9456.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45

DF9456.degrees latitude (g = 980.6199 gals.).

DF9456

DF9456.The modeled gravity was interpolated from observed gravity values.

DF9456

DF9456;

	North	East	Units	Scale	Factor	Converg.
DF9456;SPC WI S	- 60,929.821	757,677.270	MT	1.00004664	+1 19 07.5	
DF9456;SPC WI S	- 199,900.59	2,485,812.84	sFT	1.00004664	+1 19 07.5	
DF9456;UTM 16	- 4,709,425.866	411,248.120	MT	0.99969691	-0 43 50.2	

DF9456

DF9456! - Elev Factor x Scale Factor = Combined Factor

DF9456!SPC WI S - 0.99996443 x 1.00004664 = 1.00001107

DF9456!UTM 16 - 0.99996443 x 0.99969691 = 0.99966135

DF9456

DF9456

#### SUPERSEDED SURVEY CONTROL

DF9456

DF9456 NAD 83(1997)- 42 31 55.64393(N) 088 04 50.51770(W) AD( ) 1

DF9456 ELLIP H (04/02/04) 226.836 (m) GP( ) 4 1

DF9456 NAVD 88 (02/25/04) 261.270 (m) 857.18 (f) UNKNOWN 2 1

DF9456

DF9456.Superseded values are not recommended for survey control.

DF9456.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

DF9456.[See file dsdata.txt](#) to determine how the superseded data were derived.

DF9456

DF9456\_U.S. NATIONAL GRID SPATIAL ADDRESS: 16TDN1124809425(NAD 83)

DF9456\_MARKER: DD = SURVEY DISK

DF9456\_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT

DF9456\_STAMPING: SALEM E GPS 2002

DF9456\_MARK LOGO: WIDT

DF9456\_PROJECTION: FLUSH

DF9456\_MAGNETIC: R = STEEL ROD IMBEDDED IN MONUMENT

DF9456\_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL

DF9456\_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

DF9456+SATELLITE: SATELLITE OBSERVATIONS - June 09, 2008

DF9456

HISTORY	Date	Condition	Report By
DF9456 HISTORY	- 2001	MONUMENTED	WIDT
DF9456 HISTORY	- 20080609	GOOD	WIDT

DF9456

DF9456

#### STATION DESCRIPTION

DF9456

DF9456'DESCRIBED BY WI DEPT OF TRANSP 2001 (DJH)

DF9456'THE STATION IS LOCATED ABOUT 23 KM WEST-SOUTHWEST OF KENOSHA, 5 KM

DF9456'SOUTHWEST OF BRISTOL AND 4 KM SOUTHEAST OF SALEM. OWNERSHIP--TOWN OF

DF9456'SALEM. TO REACH THE STATION FROM THE JUNCTION OF STATE HIGHWAY 50

DF9456'WITH STATE HIGHWAY 75 NORTH AND STATE HIGHWAY 83 SOUTH ABOUT 24 KM

DF9456'WEST OF THE CITY OF KENOSHA, GO SOUTH ON STATE HIGHWAY 83 SOUTH FOR

DF9456'4.2 KM TO 98TH STREET ON THE LEFT, TURN LEFT AND GO EAST ON 98TH

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DATASHEETS

DF9456'STREET FOR 1.6 KM TO THE STATION ON THE LEFT. THE STATION IS A  
DF9456'BRONZE WISCONSIN DEPARTMENT OF TRANSPORTATION GEODETIC SURVEY CONTROL  
DF9456'STATION DISK SET IN THE TOP OF A 41-CM DIAMETER CONCRETE POST SET TO  
DF9456'A DEPTH OF 2.4 M AND ABOUT LEVEL WITH THE STREET PAVEMENT. THE  
DF9456'STATION IS 9.3 M NORTH OF THE CENTERLINE OF 98TH STREET, 0.2 KM EAST  
DF9456'OF CENTERLINE OF PRIVATE ENTRANCE --22725-- , 110 M WEST OF THE  
DF9456'CENTERLINE OF POWER STATION ENTRANCE, AND 2 M SOUTH OF A CULTIVATED  
DF9456'FIELD. ---NOTE---THE STATION IS SOUTH, EAST AND WEST OF AN ORANGE  
DF9456'4X4 PLASTIC WITNESS POST. ---NOTE2---THIS STATION HAS NO VISIBLE  
DF9456'OBSTRUCTIONS EXTENDING HIGHER THAN 20 DEGREES ABOVE THE HORIZON.

DF9456

DF9456

STATION RECOVERY (2008)

DF9456

DF9456'RECOVERY NOTE BY WI DEPT OF TRANSP 2008 (MAB)

DF9456'RECOVERED IN GOOD CONDITION. REPLACED TWO BROKEN GUARD POSTS. THE  
DF9456'STATION IS 1.0 M SOUTH, 1.0 M NORTHEAST, AND 1.0 M NORTHWEST OF THREE  
DF9456'4X4 ORANGE PLASTIC GUARD POSTS.

\*\*\* retrieval complete.

Elapsed Time = 00:00:00

## The NGS Data Sheet

See file [dsdata.txt](#) for more information about the datasheet.

```

DATABASE = ,PROGRAM = datasheet, VERSION = 7.85
1 National Geodetic Survey, Retrieval Date = MARCH 8, 2011
DF9472 *****
DF9472 DESIGNATION - TWIN LAKES GPS
DF9472 PID - DF9472
DF9472 STATE/COUNTY- WI/KENOSHA
DF9472 USGS QUAD - GENOA CITY (1971)
DF9472
DF9472 *CURRENT SURVEY CONTROL
DF9472
DF9472* NAD 83(2007)- 42 31 08.23467(N) 088 17 43.46568(W) ADJUSTED
DF9472* NAVD 88 - 261.974 (meters) 859.49 (feet) ADJUSTED
DF9472
DF9472 EPOCH DATE - 2002.00
DF9472 X - 140,057.854 (meters) COMP
DF9472 Y - -4,706,318.075 (meters) COMP
DF9472 Z - 4,288,420.756 (meters) COMP
DF9472 LAPLACE CORR- -2.02 (seconds) DEFLECO9
DF9472 ELLIP HEIGHT- 227.777 (meters) (02/10/07) ADJUSTED
DF9472 GEOID HEIGHT- -34.21 (meters) GEOID09
DF9472 DYNAMIC HT - 261.890 (meters) 859.22 (feet) COMP
DF9472
DF9472 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----
DF9472 Type PID Designation North East Ellip
DF9472 -----
DF9472 NETWORK DF9472 TWIN LAKES GPS 0.04 0.02 0.20
DF9472 -----
DF9472 MODELED GRAV- 980,295.9 (mgal) NAVD 88
DF9472
DF9472 VERT ORDER - SECOND CLASS I
DF9472
DF9472.The horizontal coordinates were established by GPS observations
DF9472.and adjusted by the National Geodetic Survey in February 2007.
DF9472
DF9472.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
DF9472.See National Readjustment for more information.
DF9472.The horizontal coordinates are valid at the epoch date displayed above.
DF9472.The epoch date for horizontal control is a decimal equivalence
DF9472.of Year/Month/Day.
DF9472
DF9472.The orthometric height was determined by differential leveling and
DF9472.adjusted in April 2007.
DF9472
DF9472.Photographs are available for this station.
DF9472
DF9472.The X, Y, and Z were computed from the position and the ellipsoidal ht.
DF9472

```



DF9472.The Laplace correction was computed from DEFLEC09 derived deflections.  
 DF9472  
 DF9472.The ellipsoidal height was determined by GPS observations  
 DF9472.and is referenced to NAD 83.  
 DF9472  
 DF9472.The geoid height was determined by GEOID09.  
 DF9472  
 DF9472.The dynamic height is computed by dividing the NAVD 88  
 DF9472.geopotential number by the normal gravity value computed on the  
 DF9472.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45  
 DF9472.degrees latitude (g = 980.6199 gals.).  
 DF9472  
 DF9472.The modeled gravity was interpolated from observed gravity values.  
 DF9472

DF9472;		North	East	Units	Scale	Factor	Converg.
DF9472;SPC WI S	-	59,083.891	740,070.787	MT	1.00005012		+1 10 16.4
DF9472;SPC WI S	-	193,844.40	2,428,048.91	sFT	1.00005012		+1 10 16.4
DF9472;UTM 16	-	4,708,210.741	393,592.758	MT	0.99973930		-0 52 32.0
DF9472!	-	Elev Factor	x	Scale Factor	=	Combined Factor	
DF9472!SPC WI S	-	0.99996428	x	1.00005012	=	1.00001440	
DF9472!UTM 16	-	0.99996428	x	0.99973930	=	0.99970359	

SUPERSEDED SURVEY CONTROL

DF9472 NAD 83(1997)- 42 31 08.23475(N) 088 17 43.46577(W) AD( ) B  
 DF9472 ELLIP H (04/02/04) 227.784 (m) GP( ) 3 1  
 DF9472 NAVD 88 (02/25/04) 261.998 (m) 859.57 (f) UNKNOWN 2 1  
 DF9472  
 DF9472.Superseded values are not recommended for survey control.  
 DF9472.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.  
 DF9472.[See file dsdata.txt](#) to determine how the superseded data were derived.  
 DF9472

DF9472\_U.S. NATIONAL GRID SPATIAL ADDRESS: 16TCN9359208210 (NAD 83)  
 DF9472\_MARKER: DD = SURVEY DISK  
 DF9472\_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT  
 DF9472\_STAMPING: TWIN LAKES GPS 2002  
 DF9472\_MARK LOGO: WIDT  
 DF9472\_PROJECTION: FLUSH  
 DF9472\_MAGNETIC: R = STEEL ROD IMBEDDED IN MONUMENT  
 DF9472\_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL  
 DF9472\_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR  
 DF9472+SATELLITE: SATELLITE OBSERVATIONS - April 23, 2008  
 DF9472

DF9472	HISTORY	- Date	Condition	Report By
DF9472	HISTORY	- 2001	MONUMENTED	WIDT
DF9472	HISTORY	- 20060719	GOOD	WIDT
DF9472	HISTORY	- 20061013	GOOD	JCLS
DF9472	HISTORY	- 20080423	GOOD	JCLS

STATION DESCRIPTION

DF9472'DESCRIBED BY WI DEPT OF TRANSP 2001 (DJH)  
 DF9472'THE STATION IS LOCATED ABOUT 38 KM WEST OF KENOSHA, 20 KM SOUTH OF  
 DF9472'BURLINGTON, AND 16 KM SOUTH-SOUTHEAST OF LAKE GENEVA.  
 DF9472'OWNERSHIP--KENOSHA COUNTY. TO REACH THE STATION FROM THE JUNCTION OF  
 DF9472'US HIGHWAY 12 WITH STATE HIGHWAY 173 IN THE CITY OF RICHMOND,

DF9472'ILLINOIS, GO NORTH ON US HIGHWAY 12 FOR 1.0 KM TO BURLINGTON ROAD  
 DF9472'(COUNTY HIGHWAY 4), TURN RIGHT AND GO NORTHEAST ON BURLINGTON ROAD  
 DF9472'(COUNTY HIGHWAY 4) FOR 3.4 KM TO SOUTH COUNTY HIGHWAY O (110TH  
 DF9472'STREET) ON THE LEFT, TURN LEFT AND GO WEST ON SOUTH COUNTY HIGHWAY O  
 DF9472'(110TH STREET) FOR 0.5 KM TO 400TH AVENUE (COUNTY HIGHWAY O NORTH) ON  
 DF9472'THE RIGHT, TURN RIGHT AND GO NORTH ON 400TH AVENUE (COUNTY HIGHWAY O  
 DF9472'NORTH) FOR 0.2 KM TO THE STATION ON THE LEFT. THE STATION IS A  
 DF9472'BRONZE WISCONSIN DEPARTMENT OF TRANSPORTATION GEODETIC SURVEY CONTROL  
 DF9472'STATION DISK SET IN THE TOP OF A 41-CM DIAMETER CONCRETE POST SET TO  
 DF9472'A DEPTH OF 2.4 M AND ABOUT LEVEL WITH THE ROAD PAVEMENT. THE STATION  
 DF9472'IS 7.9 M WEST OF THE CENTERLINE OF 400TH AVENUE (COUNTY HIGHWAY O  
 DF9472'NORTH), 43.6 M SOUTH OF THE NORTHERNMOST METAL POST FOR A --NO  
 DF9472'PARKING ANYTIME-- SIGN ON THE WEST SIDE OF THE ROAD, 5.6 M NORTH OF  
 DF9472'TELEPHONE PEDESTAL --L 200 73--, AND 1 M EAST OF A CULTIVATED FIELD.  
 DF9472'---NOTE---THE STATION IS NORTHWEST, SOUTHWEST AND EAST OF AN ORANGE  
 DF9472'4X4 PLASTIC WITNESS POST. ---NOTE2---THIS STATION HAS NO VISIBLE  
 DF9472'OBSTRUCTIONS EXTENDING HIGHER THAN 15 DEGREES ABOVE THE HORIZON.  
 DF9472'---NOTE3---COUNTY ROAD 4 (BURLINGTON ROAD) TURNS INTO COUNTY HIGHWAY  
 DF9472'P IN WISCONSIN.

DF9472

DF9472

STATION RECOVERY (2006)

DF9472

DF9472'RECOVERY NOTE BY WI DEPT OF TRANSP 2006 (DRB)  
 DF9472'RECOVERED IN GOOD CONDITION. ADD-- THE STATION IS 86.5 M NORTH OF A  
 DF9472'--STOP AHEAD-- SIGN POST, 78.0 M (NOT 43.6 M) NORTH (NOT SOUTH) OF THE  
 DF9472'NORTHERNMOST METAL POST FOR A --NO PARKING ANYTIME-- SIGN ON THE WEST  
 DF9472'SIDE OF THE ROAD, 41.5 M NORTH OF A FIELD ENTRANCE, AND 22.5 M  
 DF9472'NORTHWEST OF THE NORTHERNMOST METAL POST FOR A --NO PARKING ANYTIME--  
 DF9472'SIGN ON THE EAST SIDE OF THE ROAD.

DF9472

DF9472

STATION RECOVERY (2006)

DF9472

DF9472'RECOVERY NOTE BY JOHN CHANCE LAND SURVEYS INC 2006  
 DF9472'RECOVERED IN GOOD CONDITION.

DF9472

DF9472

STATION RECOVERY (2008)

DF9472

DF9472'RECOVERY NOTE BY JOHN CHANCE LAND SURVEYS INC 2008  
 DF9472'RECOVERED IN GOOD CONDITION.

\*\*\* retrieval complete.

Elapsed Time = 00:00:00

# RECORD OF U.S. PUBLIC LAND SURVEY CONTROL STATION

U S PUBLIC LAND SURVEY CORNER  $\frac{30}{30} | \frac{30}{30}$  T 1 N, R 19 E, KENOSHA COUNTY, WISCONSIN  
 GEODETIC SURVEY BY AERO-METRIC ENGINEERING, INC YEAR 1981

STATE PLANE COORDINATES OF CENTER OF SECTION

NORTH 192,971 29

EAST 2,459,655 93

ELEVATION OF STATION 857 739

HORIZONTAL DATUM WISCONSIN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE

VERTICAL DATUM NATIONAL GEODETIC VERTICAL DATUM OF 1929

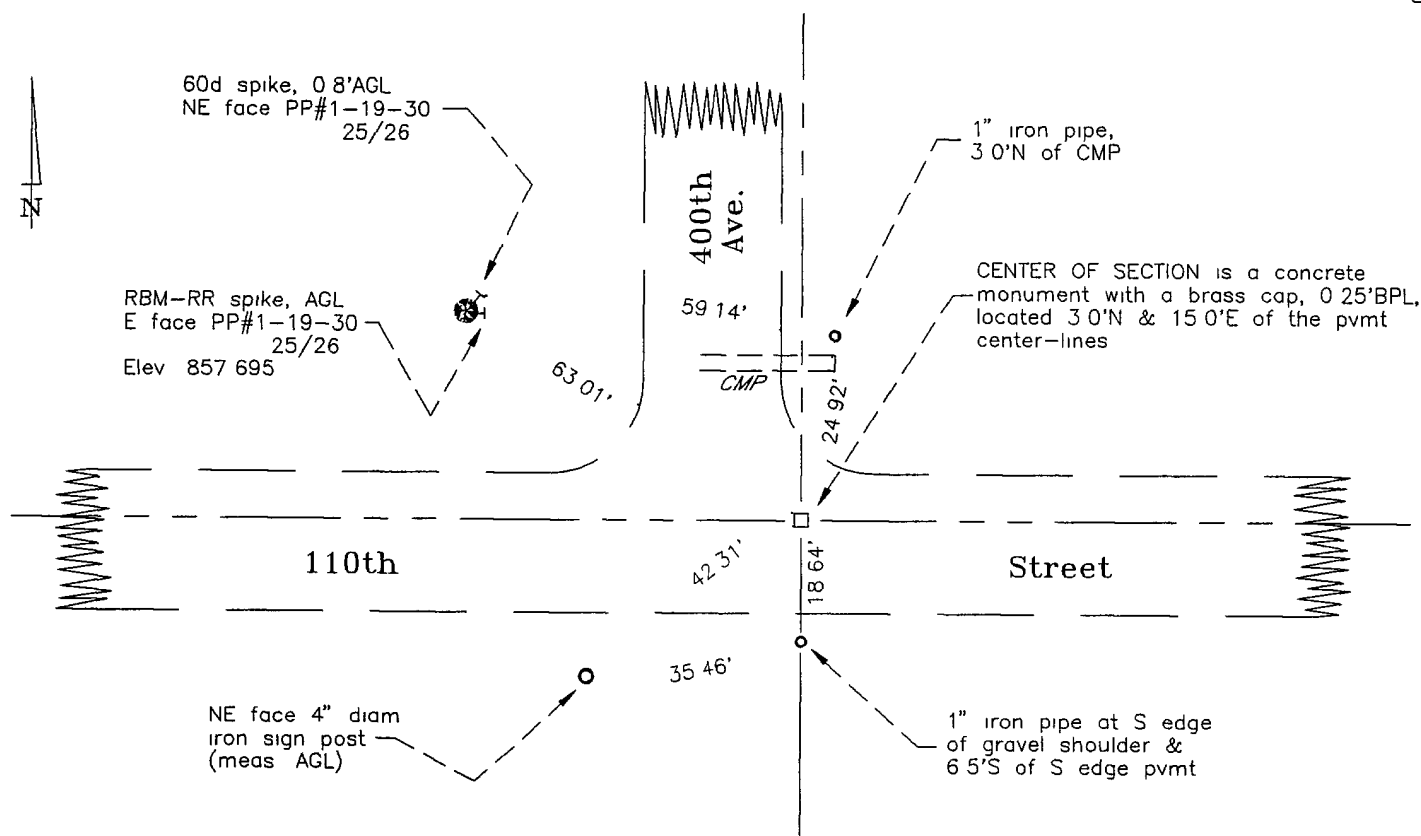
CONTROL ACCURACY THETA ANGLE +1-10-17

HORIZONTAL THIRD ORDER, CLASS I

VERTICAL SECOND ORDER, CLASS II

## LOCATION SKETCH

31



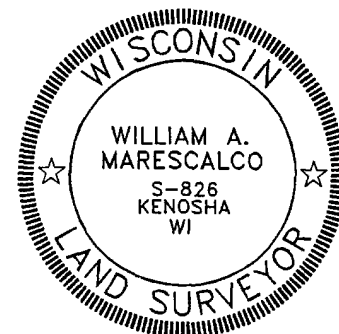
Bearing S12-56-42E to lightning rod  
 on top of conc silo with silver top, 0.75± mi

field 2-6-1997  
 rev 6-24-1997 wam

### SURVEYOR'S AFFIDAVIT

STATE OF WISCONSIN }  
 KENOSHA COUNTY } S S

I hereby certify that I relocated and referenced the public land survey corner shown hereon. In 1980, I set a Kenosha County monument at a point previously defined by R L Smith (S-190), County Surveyor, in the early 1960,s. Said monument was found to be in its original position.



DATE OF SURVEY 2-6-1997

Form designed by SEWRPC  
 Prepared by Kenosha County Surveyor

  
 REGISTERED LAND SURVEYOR

S - 826

# RECORD OF U.S. PUBLIC LAND SURVEY CONTROL STATION

U.S. PUBLIC LAND SURVEY CORNER  $\frac{7}{7} | \frac{8}{8}$  T. 2 N., R. 21 E., KENOSHA COUNTY, WISCONSIN

GEODETIC SURVEY BY: WISCONSIN DEPARTMENT OF TRANSPORTATION - Horiz. (1985) YEAR:  
 AERO-METRIC ENGINEERING, SHEBOYGAN, WI - Vert. (1986)

STATE PLANE COORDINATES OF: QUARTER CORNER .....

NORTH ..... 242,352.56 .....

EAST ..... 2,524,079.12 .....

ELEVATION OF STATION ..... 754.61 .....

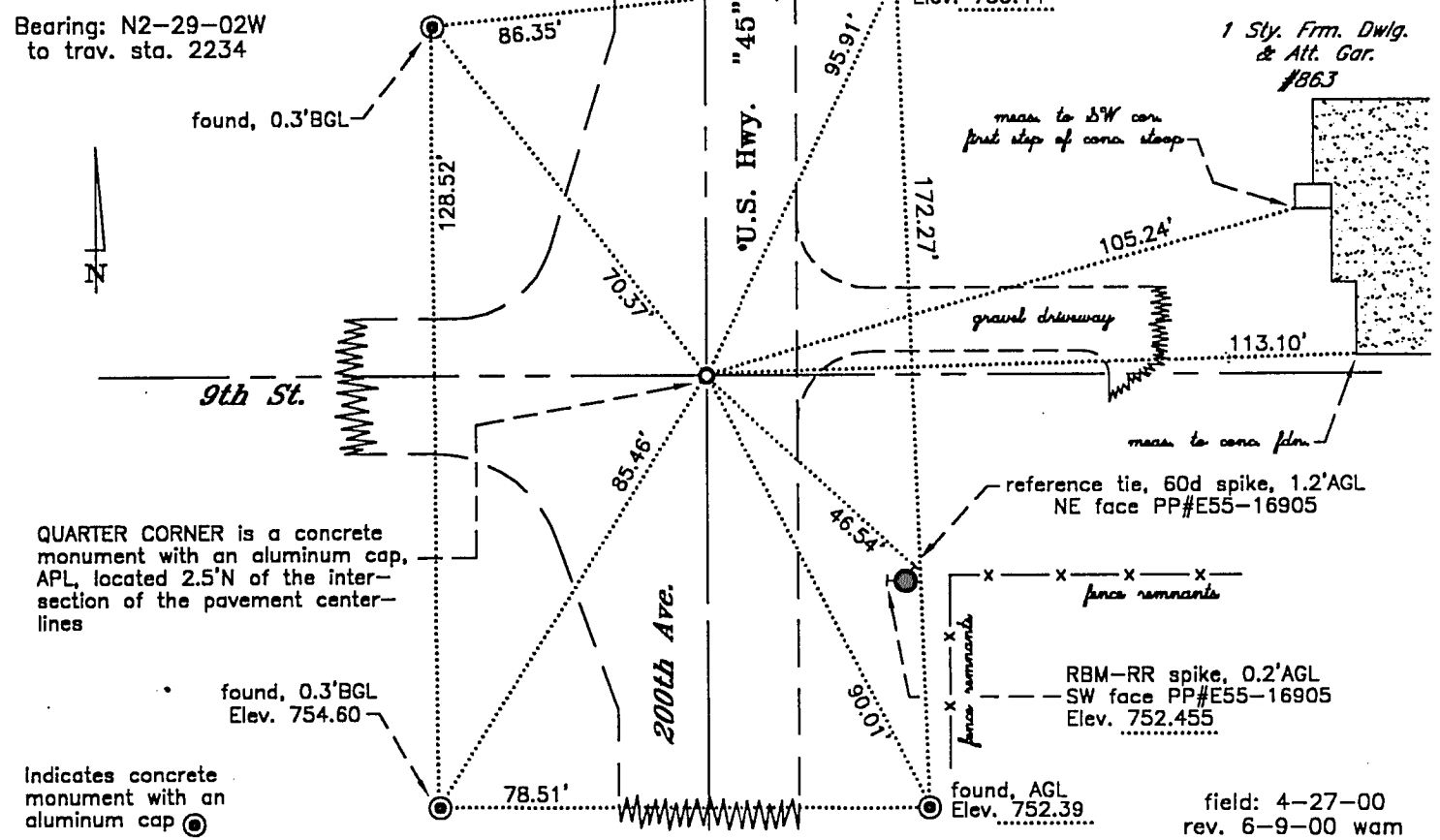
HORIZONTAL DATUM: WISCONSIN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE

VERTICAL DATUM: NATIONAL GEODETIC VERTICAL DATUM OF 1929

CONTROL ACCURACY: THETA ANGLE ..... +1-20-18 .....

HORIZONTAL: ..... THIRD ORDER, CLASS I ..... VERTICAL: ..... SECOND ORDER, CLASS II .....

## LOCATION SKETCH



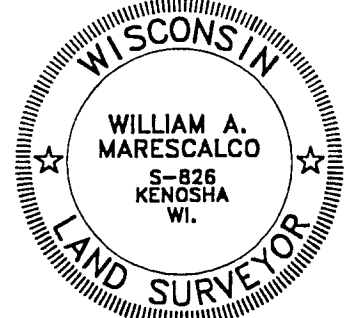
STATE OF WISCONSIN } S.S.  
 KENOSHA COUNTY }

I hereby certify that I relocated and referenced the public land survey corner shown hereon. In 1982, R.L. Smith (S-190), County Surveyor, set a Kenosha County monument at a point previously defined by H.S. Southmayd (S-422), County Surveyor, in 1955. In 1992, said Kenosha County monument was replaced with a DOT concrete monument with an aluminum cap, during their road resurfacing project. Said Dot monument was found to be in its original position.

DATE OF SURVEY: 4-27-2000

Form designed by: SBWRPC  
 Prepared by: Kenosha County Surveyor

.....  
 REGISTERED LAND SURVEYOR



S - 826

**RECORD OF U.S. PUBLIC LAND SURVEY CONTROL STATION**

U.S. PUBLIC LAND SURVEY CORNER  $\frac{23}{23}|\frac{24}{24}$  T. 1 N., R. 20 E., KENOSHA COUNTY, WISCONSIN

GEODETIC SURVEY BY: AERO-METRIC ENGINEERING, INC. - SHEBOYGAN, WI YEAR: 1983

STATE PLANE COORDINATES OF: QUARTER CORNER

NORTH ..... 199,807.12

EAST ..... 2,515,109.47

ELEVATION OF STATION .....

HORIZONTAL DATUM: WISCONSIN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE

VERTICAL DATUM: NATIONAL GEODETIC VERTICAL DATUM OF 1929

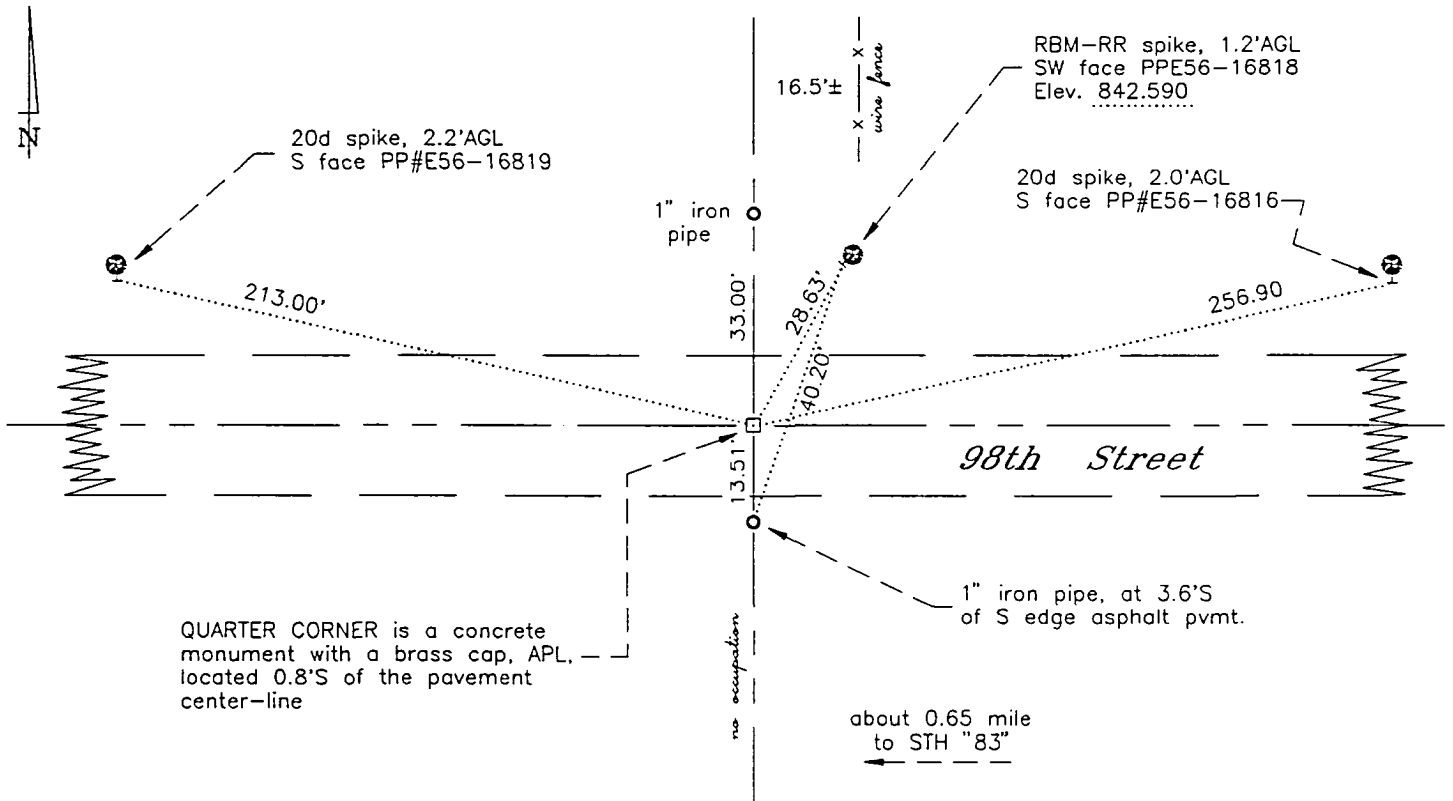
CONTROL ACCURACY: THETA ANGLE ..... +1-18-47

HORIZONTAL: ..... THIRD ORDER, CLASS I VERTICAL: ..... SECOND ORDER, CLASS II

**LOCATION SKETCH**

**County Line Road**

460



Bearing: S88-57-56W  
to traverse station 132

field: 8-26-1999  
rev. 11-16-1999 wam

**SURVEYOR'S AFFIDAVIT:**

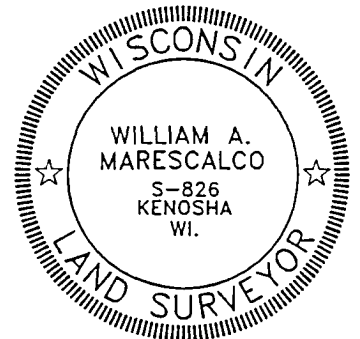
STATE OF WISCONSIN }  
KENOSHA COUNTY } S.S.

I hereby certify that I relocated and referenced the public land survey corner shown hereon. In 1976, I set a Kenosha County monument at a point previously defined by me, in 1972, based on data by H.S. Southmayd (S-422), County Surveyor, about 1950 and on file at the Kenosha County Surveyor's Office. The cap from said monument eroded out. The top 6"± of the remaining monument was removed, 4 rebars were set and a new top was poured with a new brass cap, set 8-26-1999.

DATE OF SURVEY: 8-26-1999

Form designed by: SEWRPC  
Prepared by: Kenosha County Surveyor

REGISTERED LAND SURVEYOR



S - 826

**RECORD OF U.S. PUBLIC LAND SURVEY CONTROL STATION**

U S PUBLIC LAND SURVEY CORNER  $\frac{5}{8} | \frac{5}{8}$  T 2 N. R 20 E. KENOSHA COUNTY, WISCONSIN  
 GEODETIC SURVEY BY AERO-METRIC ENGINEERING, INC YEAR 1986

STATE PLANE COORDINATES OF QUARTER CORNER

NORTH 244,245 88

EAST 2,495,178 32

ELEVATION OF STATION 803 83

HORIZONTAL DATUM WISCONSIN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE

VERTICAL DATUM NATIONAL GEODETIC VERTICAL DATUM OF 1929

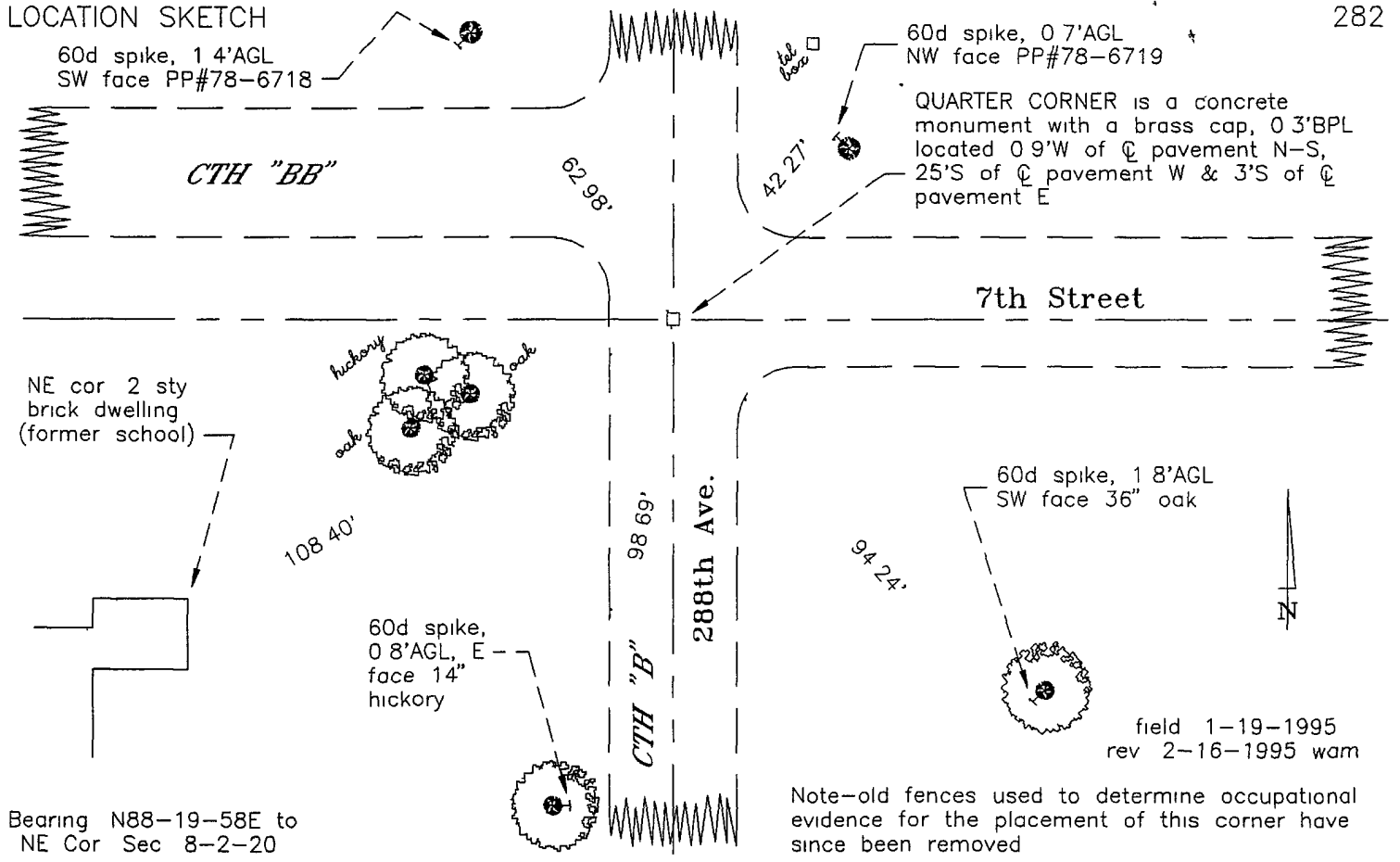
CONTROL ACCURACY THETA ANGLE +1-15-53

HORIZONTAL THIRD ORDER, CLASS I

VERTICAL SECOND ORDER, CLASS II

**LOCATION SKETCH**

282



**SURVEYOR'S AFFIDAVIT**

STATE OF WISCONSIN } S S  
 KENOSHA COUNTY }

I hereby certify that I relocated and referenced the public land survey corner shown hereon in 1984, County Surveyor, R L Smith (S-190) set a Kenosha County monument at a point previously defined by old occupational evidence. The monument set by Smith was found to be in its original position.

DATE OF SURVEY 1-19-1995

Form designed by SEWRPC  
 Prepared by Kenosha County Surveyor

*William A. Marescalco*  
 REGISTERED LAND SURVEYOR



S - 826

# RECORD OF U.S. PUBLIC LAND SURVEY CONTROL STATION

U.S. PUBLIC LAND SURVEY CORNER  $\frac{6}{7} \frac{5}{8}$  T. 1 N., R. 23 E., KENOSHA COUNTY, WISCONSIN

GEODETIC SURVEY BY: AERO-METRIC ENGINEERING, INC. - SHEBOYGAN, WI YEAR: 1980

STATE PLANE COORDINATES OF: SECTION CORNER .....

NORTH ..... 213,890.77 .....

EAST ..... 2,588,464.53 .....

ELEVATION OF STATION .....

HORIZONTAL DATUM: WISCONSIN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE

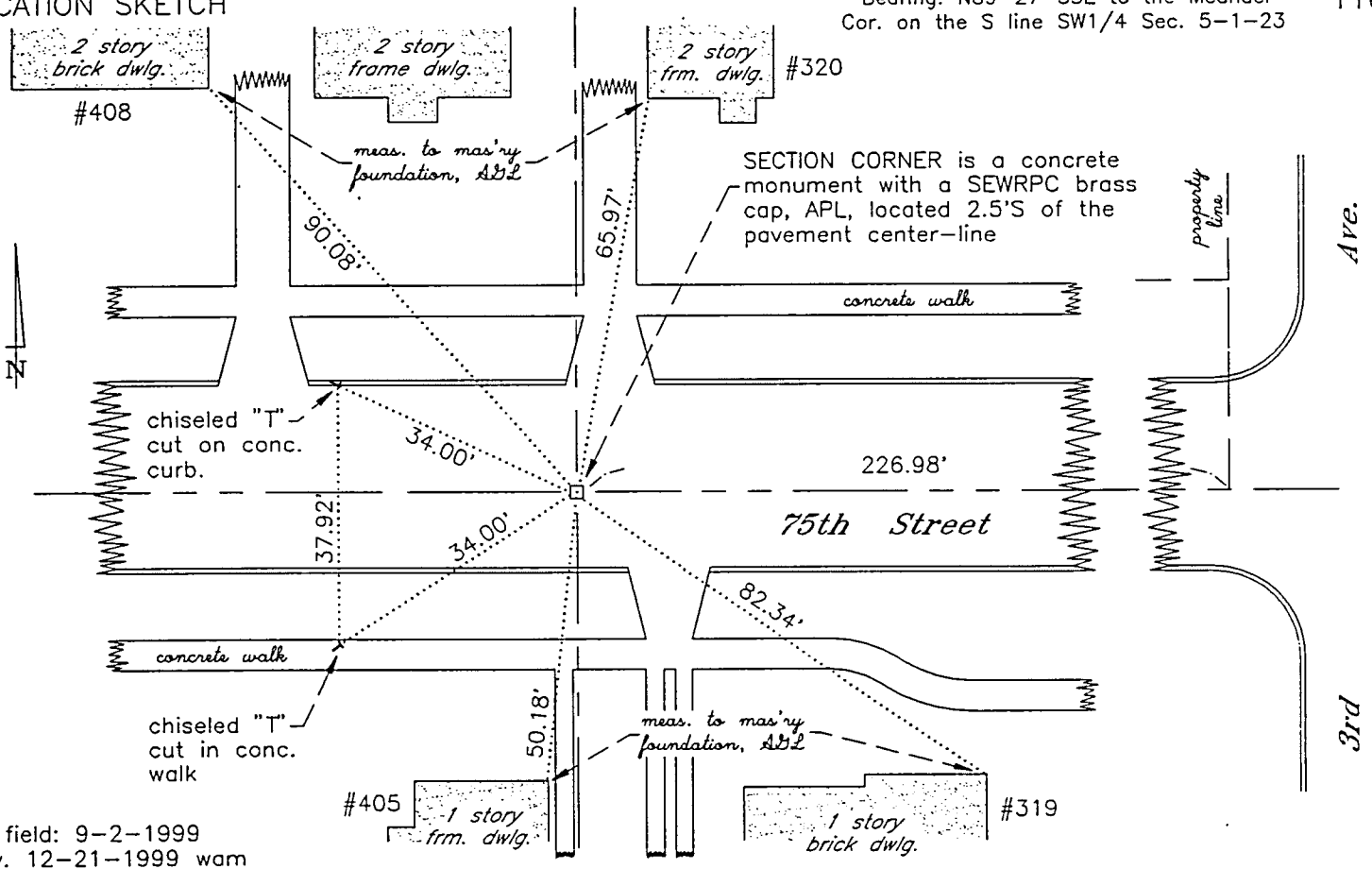
VERTICAL DATUM: NATIONAL GEODETIC VERTICAL DATUM OF 1929

CONTROL ACCURACY: THETA ANGLE ..... +1-30-03 .....

HORIZONTAL: ..... THIRD ORDER, CLASS I ..... VERTICAL: ..... SECOND ORDER, CLASS II .....

## LOCATION SKETCH

Bearing: N89-27-55E to the Meander Cor. on the S line SW1/4 Sec. 5-1-23 1165



field: 9-2-1999  
rev. 12-21-1999 wam

### SURVEYOR'S AFFIDAVIT:

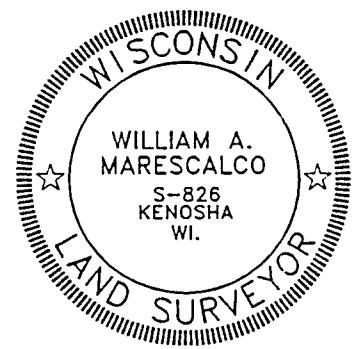
STATE OF WISCONSIN }  
KENOSHA COUNTY } s.s.

I hereby certify that I relocated and referenced the public land survey corner shown hereon. In 1979, County Surveyor, R.L. Smith (S-190), set a Kenosha County monument at a point previously defined by Lake Park Addition, W.E. O'Brien, surveyor, 1922 and Allendale Subdivision, R.C. Reinertsen, surveyor, 1921; both recorded plats. The cap of said Smith monument eroded out. The top 6" of the remaining monument was removed, 4 rebars set and a new top poured, with a new SEWRPC brass cap set, on 9-2-1999.

DATE OF SURVEY: 9-2-1999

Form designed by: SEWRPC  
Prepared by: Kenosha County Surveyor

*William A. Marescalco*  
REGISTERED LAND SURVEYOR



WISCORS

DERE (Trimble NetR5 ) Geographical coordinates  
Latitude: 44° 27' 40.88444'' N  
Longitude: 88° 3' 50.08778'' W  
Ellipsoid Height: 153.632 m

KEHA (Trimble NetR5 ) Geographical coordinates  
Latitude: 42° 33' 32.29917'' N  
Longitude: 87° 55' 9.15144'' W  
Ellipsoid Height: 204.203 m

SHAN (Trimble NetR5 ) Geographical coordinates  
Latitude: 43° 44' 51.46198'' N  
Longitude: 87° 44' 5.22551'' W  
Ellipsoid Height: 152.946 m

SIWI (Trimble NetR5 ) Geographical coordinates  
Latitude: 42° 52' 4.53392'' N  
Longitude: 87° 58' 58.56228'' W  
Ellipsoid Height: 190.721 m

WATH (Trimble NetR5 ) Geographical coordinates  
Latitude: 42° 31' 36.12582'' N  
Longitude: 88° 35' 36.3915'' W  
Ellipsoid Height: 280.585 m



1091220.02 SEWRPC-KENOSHA

\*\*\* GROUND SURVEY FILE \*\*\*

HORIZONTAL - NAD 27 WI SOUTH ZONE

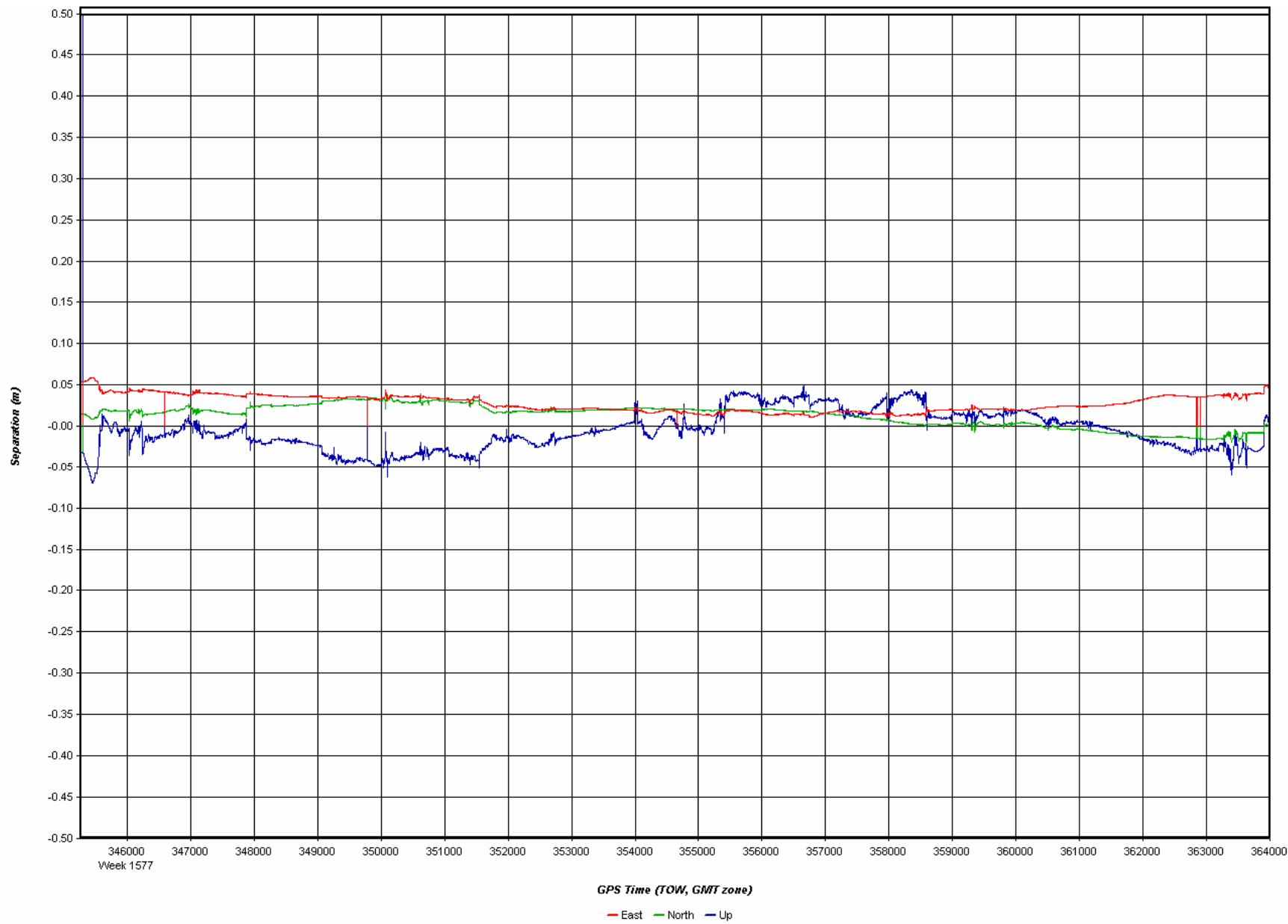
VERTICAL - NGVD29 US SURVEY FOOT

STATION	EASTING	NORTHING	ELEVATION
1	2514678.640	199798.540	846.200
2	2514758.090	199772.830	844.600
3	2515021.910	199831.960	842.130
4	2517883.760	195912.320	856.310
5	2518195.010	195874.690	844.390
6	2518275.560	195891.130	841.510
7	2528133.700	195938.480	777.870
8	2528074.940	195864.570	777.780
9	2527972.310	195988.660	779.430
10	2527831.360	196144.960	778.000
11	2527932.360	196127.080	779.560
12	2538771.470	202800.410	692.000
13	2538837.480	202818.200	691.300
14	2538803.510	202913.680	690.780
15	2538742.280	202691.870	693.530
16	2538869.490	202681.510	693.300
17	2520112.090	208307.260	807.820
18	2520076.500	208351.620	806.180
19	2520137.820	208271.730	807.610
20	2520082.220	208219.150	808.550
21	2520031.810	208331.120	807.140
22	2511381.680	199608.340	837.170
23	2511402.800	199819.530	833.520
24	2511423.420	199969.380	834.020
25	2511108.380	199655.140	837.750
26	2469044.960	197960.960	810.030
27	2468594.290	197813.300	808.850
28	2468536.020	197843.290	810.670
29	2468899.730	197768.550	802.700
30	2468895.200	197841.270	805.530
31	2464142.700	205183.360	883.030
32	2464123.630	205209.400	882.040
33	2463978.830	205155.830	882.350
34	2463851.710	205218.880	881.020
35	2463849.260	205159.210	881.470
36	2459091.620	212821.390	893.350
37	2459144.370	212858.760	894.630
38	2459160.630	212813.720	894.490
39	2459128.540	213942.900	882.100
40	2459152.900	214278.870	885.150
41	2463391.640	201252.270	870.140
42	2463508.520	201105.300	874.660
43	2463467.360	201034.110	878.650
44	2463179.080	201302.000	871.650
45	2463170.870	201430.350	874.320
46	2495178.000	244271.020	803.780
47	2495249.660	244218.850	802.650
48	2495071.250	244233.060	803.370
49	2495198.390	244534.300	803.460
50	2495205.870	244389.370	801.550
51	2503303.460	234796.920	792.750
52	2503370.600	235255.510	797.030
53	2503315.060	235302.240	797.380
54	2503236.500	235080.470	793.840
55	2503178.330	235071.500	795.610
56	2504189.010	237555.080	832.760

57	2504207.860	237510.270	832.450
58	2504205.260	237407.370	831.610
59	2504327.940	237511.750	834.920
60	2504244.640	237635.380	836.270
61	2508375.650	244608.980	805.010
62	2508269.300	244707.930	806.330
63	2508232.270	244723.400	808.690
64	2508263.720	244618.640	808.000
65	2508331.060	244663.710	806.830
66	2524114.810	242353.360	753.050
67	2524114.320	242388.610	753.130
68	2524046.680	242350.320	754.520
69	2524029.440	242291.920	757.950
70	2524129.980	242287.780	751.470
71	2532629.890	225356.830	723.980
72	2532586.070	225358.070	723.760
73	2532668.610	225079.180	717.770
74	2532585.600	225017.110	714.880
75	2532616.210	224825.840	713.840
76	2545857.380	226866.580	765.520
77	2547665.800	232224.360	740.770
78	2547610.360	232136.810	740.810
79	2547188.230	232212.020	741.600
80	2547259.170	232210.980	738.360
81	2588555.790	218590.820	593.340
82	2588682.640	218740.610	589.500
83	2588690.910	218946.350	586.740
84	2588764.370	219122.420	588.420
85	2588457.070	218475.990	594.580
86	2582952.880	206648.680	623.490
87	2582958.590	206816.680	624.010
88	2583178.710	206865.750	624.970
89	2583488.250	206737.280	623.470
90	2583393.350	206684.770	624.180
91	2587457.010	213882.030	606.660
92	2587441.670	213961.840	606.280
93	2587473.480	213947.480	605.340
94	2587489.940	213826.970	605.950
95	2587480.370	213718.120	605.630
96	2589185.990	211290.220	594.390
97	2589182.940	211602.140	592.830
98	2589357.300	212104.600	590.490
99	2589151.810	212374.830	594.640
100	2589254.160	211729.460	594.360
E7221	2524079.670	242352.990	754.390
S5220	2495178.000	244246.270	803.900
C30119	2459655.630	192971.620	857.770
SW5123	2588465.360	213891.040	591.430
SE23120	2515109.530	199807.310	843.820
TOLEGPSCK	2538922.350	202630.100	694.310
IGHTONNGPS	2494197.460	244226.150	791.410
INLAKESGPS	2459585.240	193835.070	859.780
PARISCGPS	2530810.260	238417.990	721.880
RAIRIEEGPS	2589340.820	211966.950	592.950
SALEMEGPS	2517348.890	199890.740	857.410

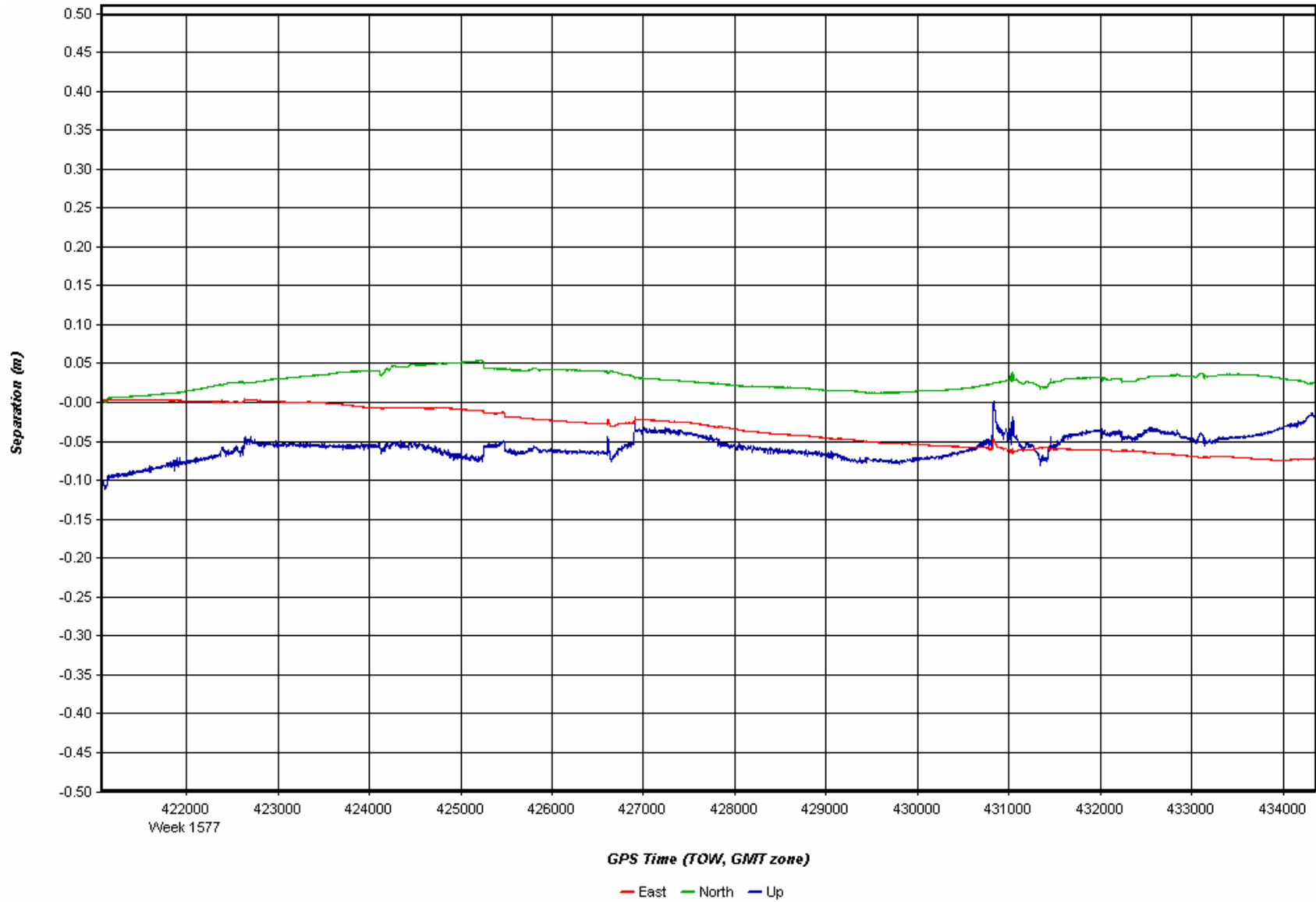
# Separation Plot

M033110A



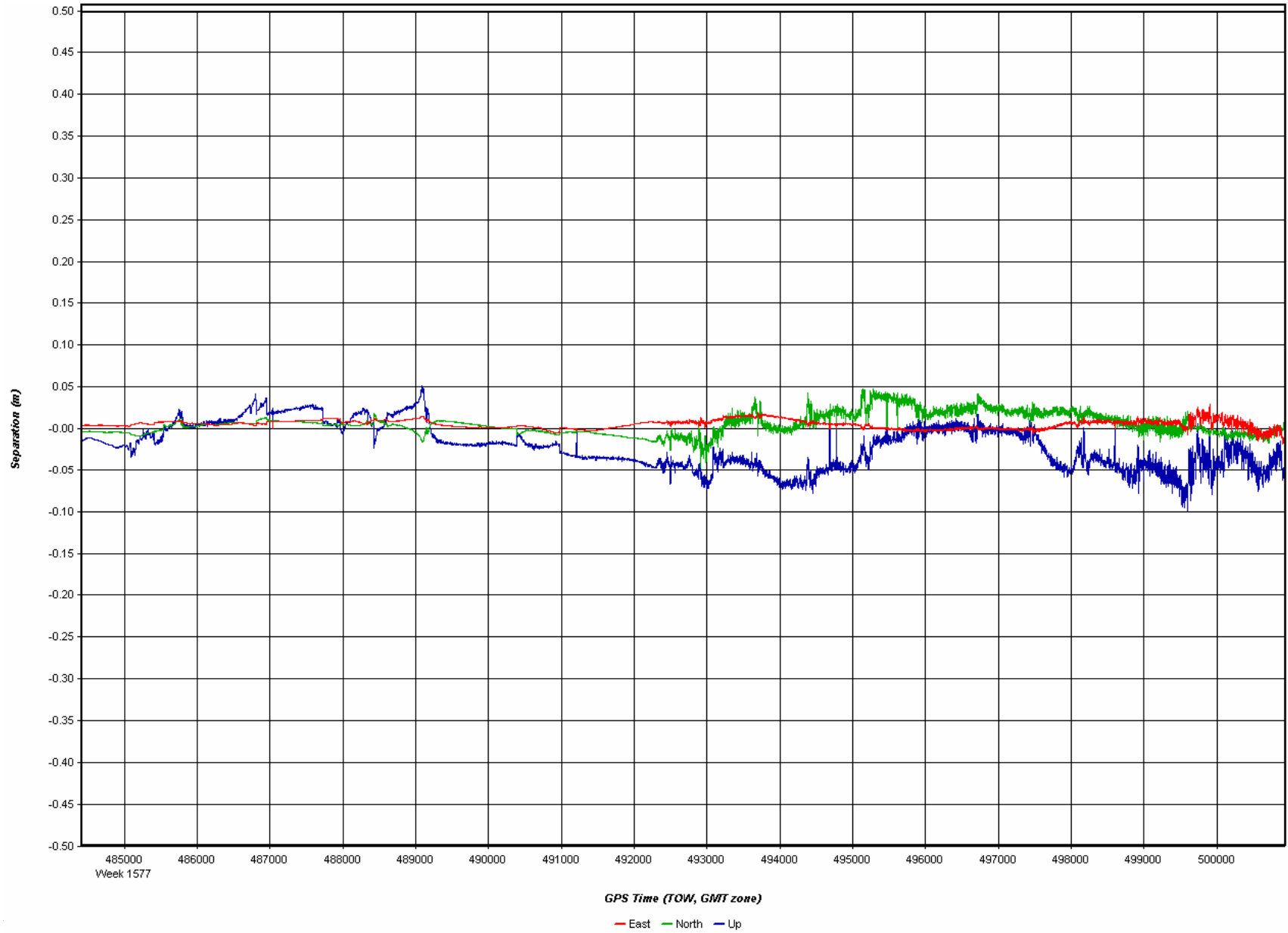
# Separation Plot

## L040110A



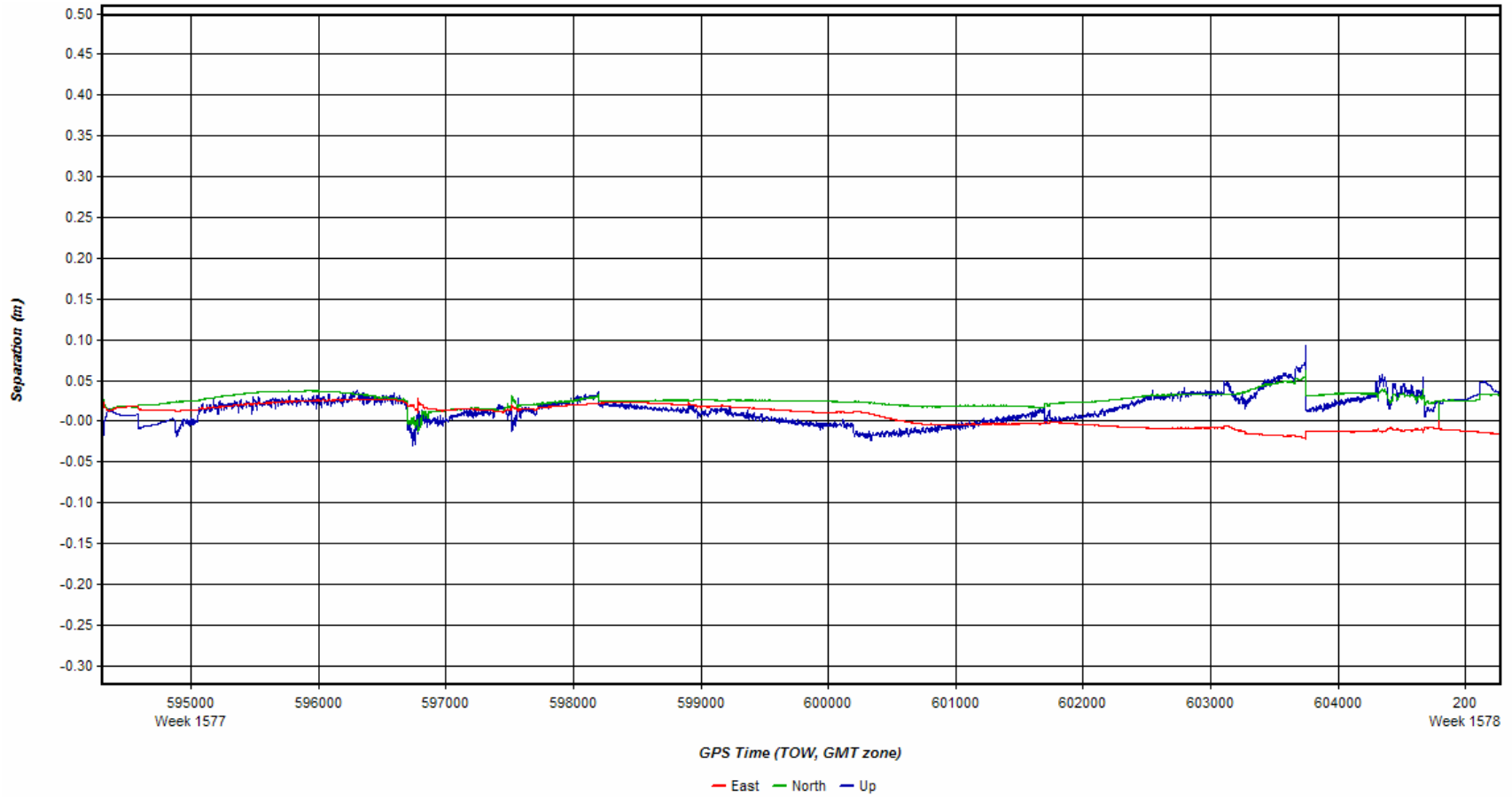
# Separation Plot

L040210A



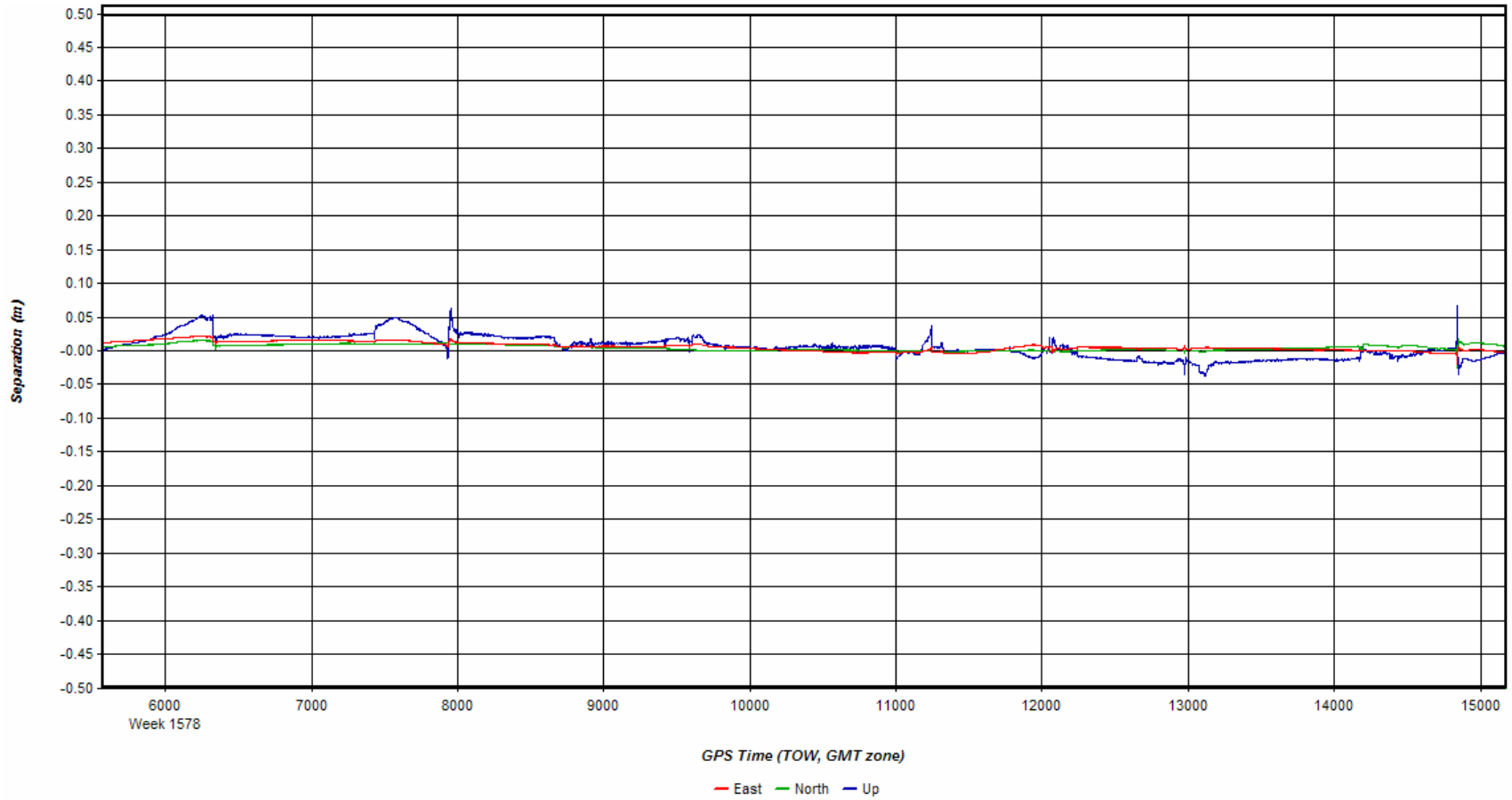
# Separation Plot

## L040310A



# Separation Plot

## L040410A



# Separation Plot

## L040410A-B

