

PSM Traverse Report

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Revision, December 2019, text in red

Phillips Rd Improvements, Project 1709, between Schlegel Rd, and Lake Rd, Town of Webster, County of Monroe, NY

Prepared for Monroe County Dept. of Transportation

The project survey traverse consists of 7 new permanent monuments set along and inside the ROW of Phillips Road. The monuments were placed at approximate equal spacing, along length of project, which runs primarily north/south end to end. Initial project control was provided by Lu Engineers and Prudent Engineering as part of construction drawings. Reported horizontal datum is referenced to NAVD 1983 (2011), NYSPCS, West Zone (3103). The project scale factor is 1.00003734. Initial control was established from GPS RTK methods (by Prudent Engineers) using CORS station. Project vertical datum is NAVD88 (NYSNET). A GPS/RTK traverse was run by Zoladz Construction prior to construction. The horizontal and vertical control was checked and verified. The traverse points used are the project baseline control points found on sheet BL-1 of construction drawings. A copy of Zoladz GPS Site Calibration Report, performed at the beginning of project, has been added to this report. During project, a pair of control points at south end, and a pair of control points at north end, were maintained and monitored. The monitored points are cbp1, cbp2 (south) and cbp9, cbp10 (north). These control points are baseline control points from project documents mentioned above. These points are also the starting and ending point pairs for PSM traverse. Control point cbp1 and cbp9 were used for a sighting azimuth only.

Control point monitoring was performed by GPS RTK when project surveyor was called to site. If a point measured beyond the 0.05' horizontal/vertical tolerance it was remeasured and recorded as moved. During project, control point cbp9 was found with the cap disturbed and remeasured as cbp9rev. A record of measurement is attached to this report.

The PSM traverse was run between control points pairs using a total station. A Trimble SPS 930 total station was used. Specifications are included with this report.

The traverse was measured by 2 direct and 2 reversed angles. Distances measured direct and reverse at foresight and back sight location. Data was recorded using Trimble Siteworks software on TSC7 data collector. Horizontal angle difference held to less than 5". Direct and reverse distance to .02' or less. The distances were measured in ground units and adjusted for scale factor at the office. Before adjustment horizontal closure = 1:35804', vertical = 1:106823'. After adjustment, horizontal closure = 1:66800', vertical closure = 1:106823'. Traverse length = 10228.488'. Raw horizontal closure (before adjustment) exceeds the minimum 1:20000 necessary to obtain positional accuracy greater than project specification. In theory, the closure will pass a least squares analysis. However, additional control points were not available for redundancy. Angle closure error= 6.72", total horizontal error= 0.153', total vertical error= 0.096'. Angular error adjusted by equal proportions at traverse stations. Vertical error adjusted proportional to distance. The traverse was adjusted using Compass/Bowditch method. The attached "Traverse Adjustment Report" shows adjusted coordinates of the balanced traverse.

A least squares adjustment was not used to balance traverse for the following reasons:

1. The actual PSM's were occupied and traversed through. The PSM's are spaced with nearly equal legs and horizontal angles are approximately 180 degrees between.
2. There are no side shots to PSM control. The project control within highway boundary could not be maintained during construction. Unfortunately, most control was in road bed and immediately adjacent. Due to line of sight issues and disturbance to private property, control was not transferred outside of highway boundary. The use of GPS/RTK allowed project to proceed without intervisible traverse points and conventional methods.
3. GPS/RTK was used by project engineer to verify road sub-grades. The engineer was satisfied with accuracy and repeatability of these measurements.
4. There are no unbalanced distances between back sights and foresights.
5. The traverse has no stations with open leg sub traverses that least squares would be weight differently.
6. Vertical change, between PSM stations, is equal and proportional with decreasing elevation from south to north.

The least squares adjustment software requires input of parameters to weight unequal traverse legs, short and long side shots, unequal vertical angles, and other unbalanced measurements. Upon consultation with Trimble software support and a licensed surveyor, it was recommended we use the Compass adjustment. The small closure error is then weighted equally and proportional at each station.

In an attempt to generate sufficient data for a least square's analysis, a GPS observation was made at each PSM point. A direct/reverse observation (with rod turned 180° between measurements) was made. A set was recorded in July 2019 and Nov. 2019. The observations were averaged. A least squares analysis was done holding UTS data as control. The attached report shows standard deviations of: Northing 0.012', Easting 0.033', Elevation 0.025', Overall 0.038'. While slightly over minimum spec., the deviations are within those expected from GPS data. It also shows that UTS adjustments did not favor or distort any traverse station independently. The UTS data is still considered control and not adjusted from original submittal of this report.

Included with this report find:

1. Means and Methods Report, revised Dec., 2019.
2. Traverse Adjustment Report
3. Permanent Survey Marker information and tie sheets. Monroe County template. One for each PSM, a total of 7.
4. Traverse Alignment Geometry Report (azimuth and distance between stations)
5. PSM Traverse raw data report
6. Traverse field note setup sheet
7. Total station specification sheet
8. GPS Site Calibration Report
9. cbp9 remeasurement data
10. Least squares analysis of UTS vs. GPS with backup data.

The above data will be forwarded by email to Monroe County Surveyor. A certified copy, signed by New York State Land Surveyor, will be mailed to County Surveyor.

Report prepared by Paul Glassman, Zoladz Construction Surveyor

August 20, 2019

Amended December 13, 2019

We, Zoladz Construction certify this report was prepared on August 20, 2019, from field measurements made in July 2019.

Signed: Neal R. Klettke

Neal R. Klettke, NYSPLS License No. 049505



Place surveyor seal above

Project file data		Coordinate System	
Name:	S:\Zoladz\Estimating\2018 Job Folder\18-004-C Phillips Road Reconstruction\Survey\Phillips Rd. uts traverse2.vce	Name:	Scale Only
Size:	58 KB	Datum:	
Modified:	12/6/2019 3:38:22 PM (UTC:-5)	Zone:	
Time zone:	Eastern Standard Time	Geoid:	
Reference number:		Vertical datum:	
Description:		Calibrated site:	
Comment 1:			
Comment 2:			
Comment 3:			

## Traverse Adjustment Report

### Summary

<b>Traverse name:</b>	uts2-2	<b>Adjustment method:</b>	Compass/Bowditch
<b>Adjustment mode:</b>	Adjust automatically	<b>Angular adjustment:</b>	Equal proportions
<b>Adjustment date:</b>	12/6/2019 3:38:09 PM	<b>Vertical adjustment:</b>	Proportional to distance
<b>Adjusted points:</b>	8		

### End-Point Orientations

<b>Start point:</b>	cbp2	<b>End point:</b>	cbp10
<b>Orientation method:</b>	Single Point	<b>Orientation method:</b>	Single Point
<b>Orientation point:</b>	cpb1	<b>Orientation point:</b>	cdp9 rev
<b>Point azimuth:</b>	178°20'58"	<b>Point azimuth:</b>	98°15'56"

### Before Adjustment

<b>Angular misclosure:</b>	-6.718 sec (40.000 sec)	<b>Traverse length:</b>	10228.488 ft
<b>Northing misclosure:</b>	-0.137 ft	<b>Vertical misclosure:</b>	0.096 ft
<b>Easting misclosure:</b>	-0.250 ft	<b>Vertical precision:</b>	1:106823
<b>Longitudinal:</b>	-0.099 ft	<b>Horizontal misclosure:</b>	0.286 ft
<b>Transversal:</b>	-0.268 ft	<b>Horizontal precision:</b>	1:35804

### After Angular Adjustment

<b>Angular misclosure:</b>	0.000 sec	<b>Traverse length:</b>	10228.488 ft
<b>Northing misclosure:</b>	-0.101 ft	<b>Vertical misclosure:</b>	0.096 ft
<b>Easting misclosure:</b>	-0.115 ft	<b>Vertical precision:</b>	1:106823 (1:25000)
<b>Longitudinal:</b>	-0.083 ft	<b>Horizontal misclosure:</b>	0.153 ft
<b>Transversal:</b>	-0.129 ft	<b>Horizontal precision:</b>	1:66800 (1:50000)

### After Distance Adjustment

<b>Northing misclosure:</b>	0.000 ft	<b>Vertical misclosure:</b>	0.000 ft
<b>Easting misclosure:</b>	0.000 ft	<b>Post rotation:</b>	0.000 sec

### Fixed Points

Point	Northing	Easting	Elevation
cbp1	1181410.280 ft	1458412.370 ft	0.000 ft
cbp2	1182840.214 ft	1458371.151 ft	354.680 ft
cbp10	1192013.246 ft	1457008.151 ft	293.016 ft
cdp9 rev	1191853.750 ft	1458106.080 ft	288.720 ft

### Reduced Horizontal Distances Before Adjustment

Station	Reverse Distance	Forward Component	Forward Difference from Mean	Reciprocal Component	Reciprocal Difference from Mean	Meaned Forward Distance
cbp2 (S41)	?	751.542 ft	-0.018 ft	751.578 ft	0.018 ft	751.560 ft
8-1 (S42)	751.578 ft	839.437 ft	-0.012 ft	839.461 ft	0.012 ft	839.449 ft
8-2 (S43)	839.461 ft	1474.956 ft	0.006 ft	1474.944 ft	-0.006 ft	1474.950 ft
8-3 (S44)	1474.944 ft	1571.851 ft	0.005 ft	1571.842 ft	-0.005 ft	1571.846 ft
8-4 (S45)	1571.842 ft	1526.488 ft	-0.002 ft	1526.492 ft	0.002 ft	1526.490 ft
8-5 (S46)	1526.492 ft	1466.111 ft	0.002 ft	1466.107 ft	-0.002 ft	1466.109 ft
8-6 (S47)	1466.107 ft	543.466 ft	-0.001 ft	543.468 ft	0.001 ft	543.467 ft
tp1 (S48)	543.468 ft	900.434 ft	0.002 ft	900.431 ft	-0.002 ft	900.433 ft
8-7 (S49)	900.431 ft	1154.183 ft	-0.001 ft	1154.184 ft	0.001 ft	1154.184 ft
cbp10 (S50)	1154.184 ft	1109.405 ft	0.000 ft	?	?	1109.405 ft

### Horizontal Adjustments

From Station	Azimuth Adjustment	Adjusted Azimuth	Northing Adjustment	Adjusted Northing	Easting Adjustment	Adjusted Easting
cbp2 (S41)	0.672 sec	359°42'04"	0.000 ft	1182840.214 ft	0.000 ft	1458371.151 ft
8-1 (S42)	1.344 sec	358°12'48"	0.007 ft	1183591.771 ft	0.008 ft	1458367.240 ft
8-2 (S43)	2.015 sec	358°03'29"	0.016 ft	1184430.821 ft	0.018 ft	1458341.078 ft
8-3 (S44)	2.687 sec	359°41'24"	0.030 ft	1185904.938 ft	0.035 ft	1458291.112 ft
8-4 (S45)	3.359 sec	358°11'06"	0.046 ft	1187476.777 ft	0.052 ft	1458282.627 ft
8-5 (S46)	4.031 sec	356°47'19"	0.061 ft	1189002.516 ft	0.070 ft	1458234.294 ft
8-6 (S47)	4.702 sec	358°46'45"	0.075 ft	1190466.338 ft	0.086 ft	1458152.180 ft
tp1 (S48)	5.374 sec	1°05'11"	0.080 ft	1191009.687 ft	0.092 ft	1458140.609 ft
8-7 (S49)	6.046 sec	275°08'00"	0.089 ft	1191909.966 ft	0.102 ft	1458157.692 ft
cbp10 (S50)	6.718 sec	98°15'56"	0.101 ft	1192013.246 ft	0.115 ft	1457008.151 ft

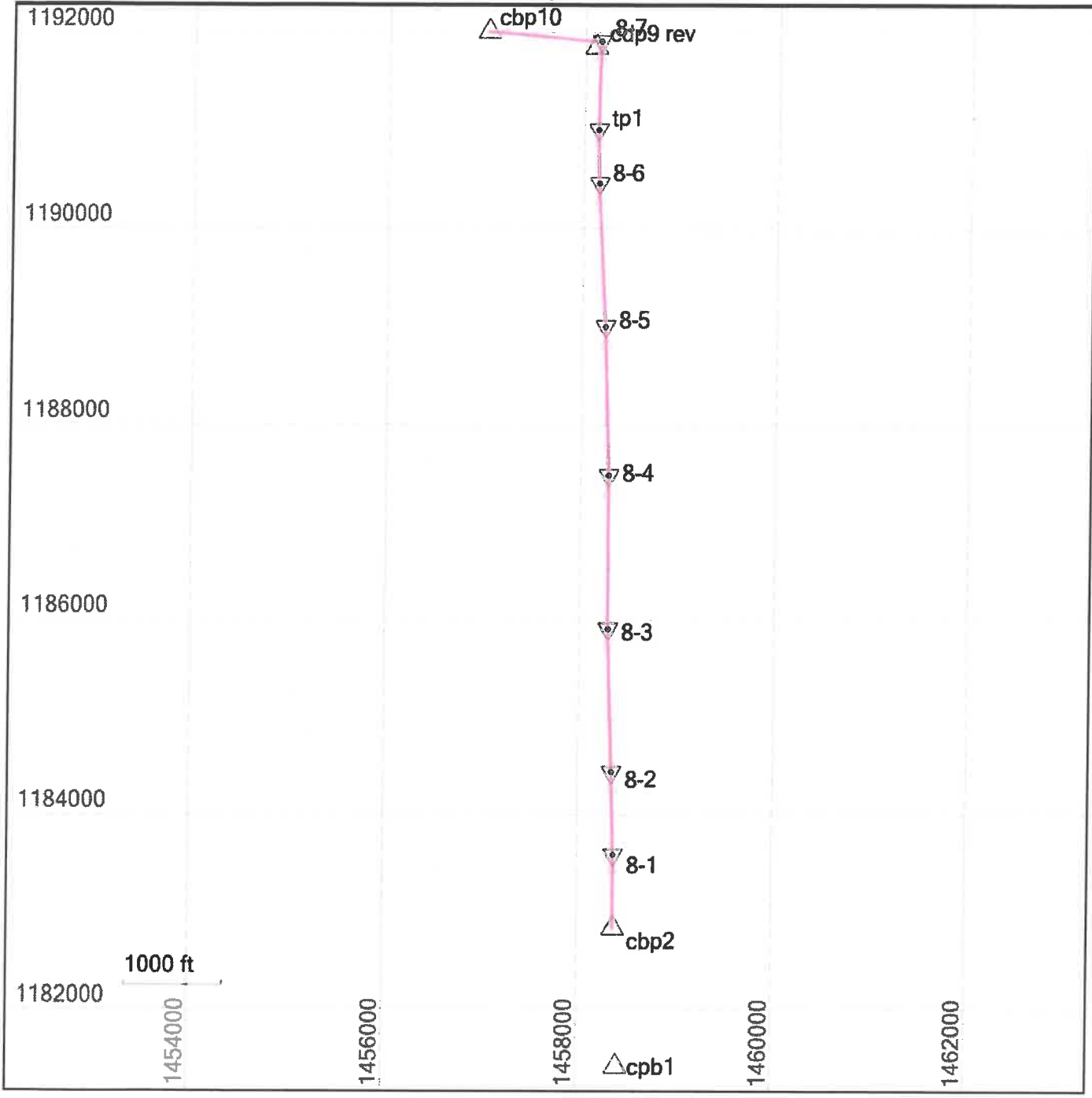
### Reduced Vertical Distances Before Adjustment

Station	Reverse Distance	Forward Component	Forward Difference from Mean	Reciprocal Component	Reciprocal Difference from Mean	Meaned Forward Distance
cbp2 (S41)	?	-6.926 ft	0.035 ft	6.996 ft	-0.035 ft	-6.961 ft
8-1 (S42)	6.996 ft	-2.934 ft	-0.002 ft	2.930 ft	0.002 ft	-2.932 ft
8-2 (S43)	2.930 ft	-5.928 ft	0.004 ft	5.935 ft	-0.004 ft	-5.932 ft
8-3 (S44)	5.935 ft	-13.210 ft	-0.028 ft	13.154 ft	0.028 ft	-13.182 ft
8-4 (S45)	13.154 ft	-11.964 ft	-0.025 ft	11.914 ft	0.025 ft	-11.939 ft
8-5 (S46)	11.914 ft	-8.057 ft	0.021 ft	8.099 ft	-0.021 ft	-8.078 ft
8-6 (S47)	8.099 ft	-3.817 ft	0.006 ft	3.829 ft	-0.006 ft	-3.823 ft
tp1 (S48)	3.829 ft	-11.926 ft	0.003 ft	11.931 ft	-0.003 ft	-11.929 ft
8-7 (S49)	11.931 ft	3.169 ft	-0.038 ft	-3.245 ft	0.038 ft	3.207 ft
cbp10 (S50)	-3.245 ft	-4.132 ft	0.000 ft	?	?	-4.132 ft

### Vertical Adjustments

From Station	Vertical Adjustment	Adjusted Vertical
cbp2 (S41)	0.000 ft	354.680 ft
8-1 (S42)	-0.007 ft	347.711 ft
8-2 (S43)	-0.015 ft	344.772 ft
8-3 (S44)	-0.029 ft	338.826 ft
8-4 (S45)	-0.043 ft	325.630 ft
8-5 (S46)	-0.058 ft	313.676 ft
8-6 (S47)	-0.071 ft	305.585 ft
tp1 (S48)	-0.077 ft	301.757 ft
8-7 (S49)	-0.085 ft	289.820 ft
cbp10 (S50)	-0.096 ft	293.016 ft

### Layout



12/6/2019 3:53:51 PM	S:\Zoladz\Estimating\2018 Job Folder\18-004-C Phillips Road Reconstruction\Survey\Phillips Rd. uts traverse2.vce	Trimble Business Center
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**MONROE COUNTY DEPARTMENT OF TRANSPORTATION  
"ROAD NAME" HIGHWAY PROJECT  
PERMANENT SURVEY MARKER PSM 8-1**

**Phillips Road- County Rte. 8 Improvements  
from Schlegel Rd (CR3) to Lake Rd (CR1)  
Town of Webster, Monroe Cty. , NY  
CIP No. 1709**



**SURVEY CERTIFICATION**

I hereby certify that the Permanent Survey Marker listed hereon was installed and positioned in accordance with and to the degree of accuracy required by Section C625.06 of the Monroe County Department of Transportation Standard specifications, and that the marker is within a horizontal positional closure of 1:66880'. based on existing project monumentation and/or data.

Signed: *Neal R. Klettke* Date: 12-18-2019

**Neal R. Klettke, PLS**  
New York State Licensed Land Surveyor # **049505**

ALL UNITS ARE ENGLISH AND U.S. SURVEY FEET

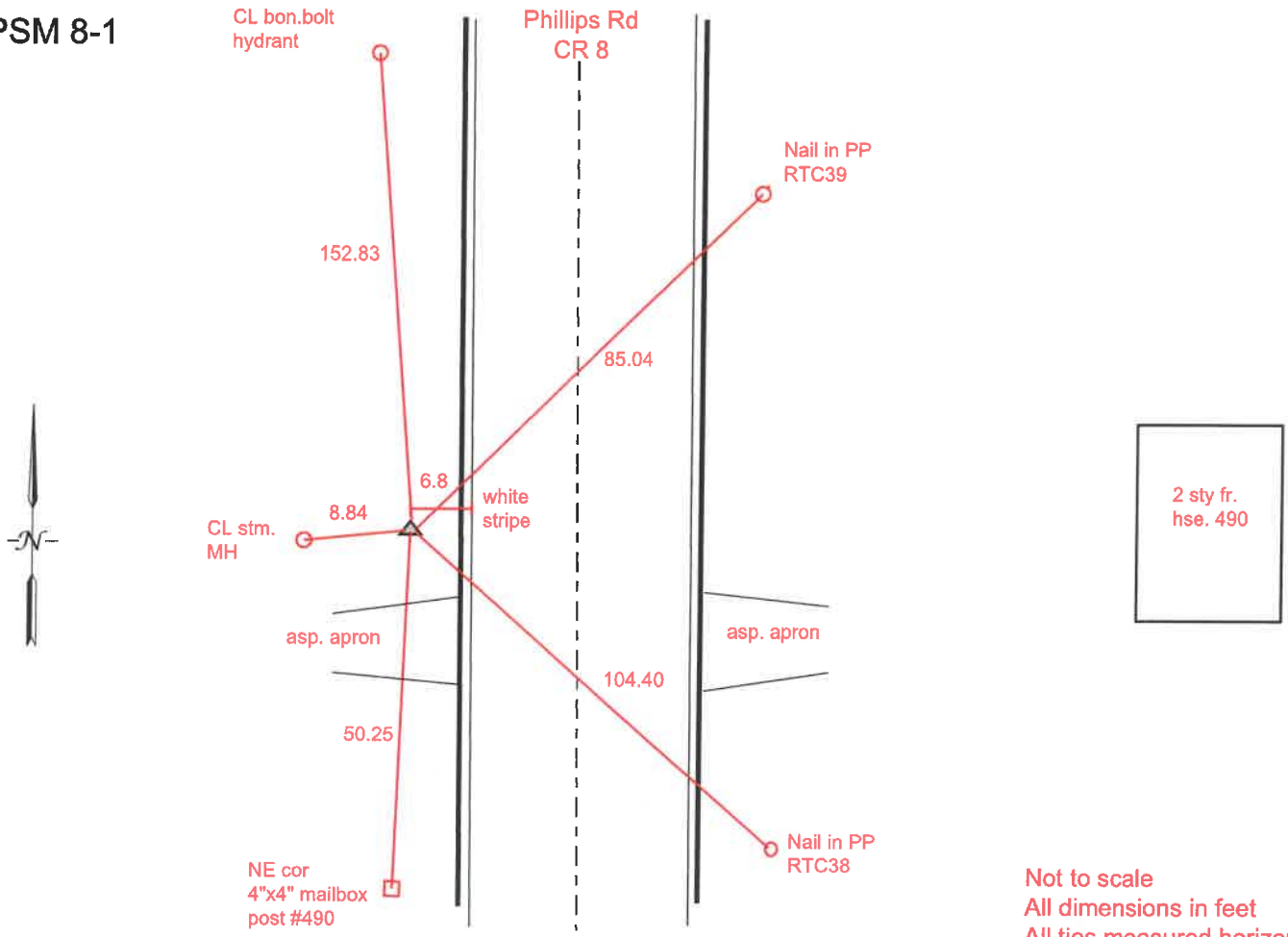
HORIZONTAL DATUM: <b>NAD 1983 (2011)</b>	NYS PLANE COORDINATE SYSTEM ZONE: <b>West (3013)</b>		
GRID NORTHING (Y): <b>1183591.771</b>	DISTANCE & DIRECTION TO PRECEDING & SUCCEEDING PSM		
GRID EASTING (X): <b>1458367.240</b>	PSM NUMBER	DISTANCE	AZIMUTH
COMBINED FACTOR: <b>1.00003734</b>	<b>exist. CBP-2</b>	<b>751.567</b>	<b>179°42'07"</b>
VERTICAL DATUM: <b>NAVD 88 (NYSNET)</b>	<b>PSM 8-2</b>	<b>839.458</b>	<b>358°12'51"</b>
ORTHOMETRIC ELEVATION: <b>347.711</b>			

**MONUMENT LOCATION AND DETAILED MATERIAL DESCRIPTION**

MCDOT standard 3" brass disk in concrete set flush. Magnetic traceable. Phillips Rd. Centerline station 104+48.9, 18'L, opposite hse. #490.  
Stamped "PSM 8-1"

**SKETCH OF MARKER WITH TIES**

**PSM 8-1**



Not to scale  
All dimensions in feet  
All ties measured horizontal

**MONROE COUNTY DEPARTMENT OF TRANSPORTATION  
"ROAD NAME" HIGHWAY PROJECT  
PERMANENT SURVEY MARKER PSM 8-2**

**Phillips Road- County Rte. 8 Improvements  
from Schlegel Rd (CR3) to Lake Rd (CR1)  
Town of Webster, Monroe Cty. , NY  
CIP No. 1709**



**SURVEY CERTIFICATION**

I hereby certify that the Permanent Survey Marker listed hereon was installed and positioned in accordance with and to the degree of accuracy required by Section C625.06 of the Monroe County Department of Transportation Standard specifications, and that the marker is within a horizontal positional closure of 1:66880', based on existing project monumentation and/or data.

Signed: *Neal R. Klettke* Date: 12-23-2019

**Neal R. Klettke, PLS**  
New York State Licensed Land Surveyor # **049505**

ALL UNITS ARE ENGLISH AND U.S. SURVEY FEET

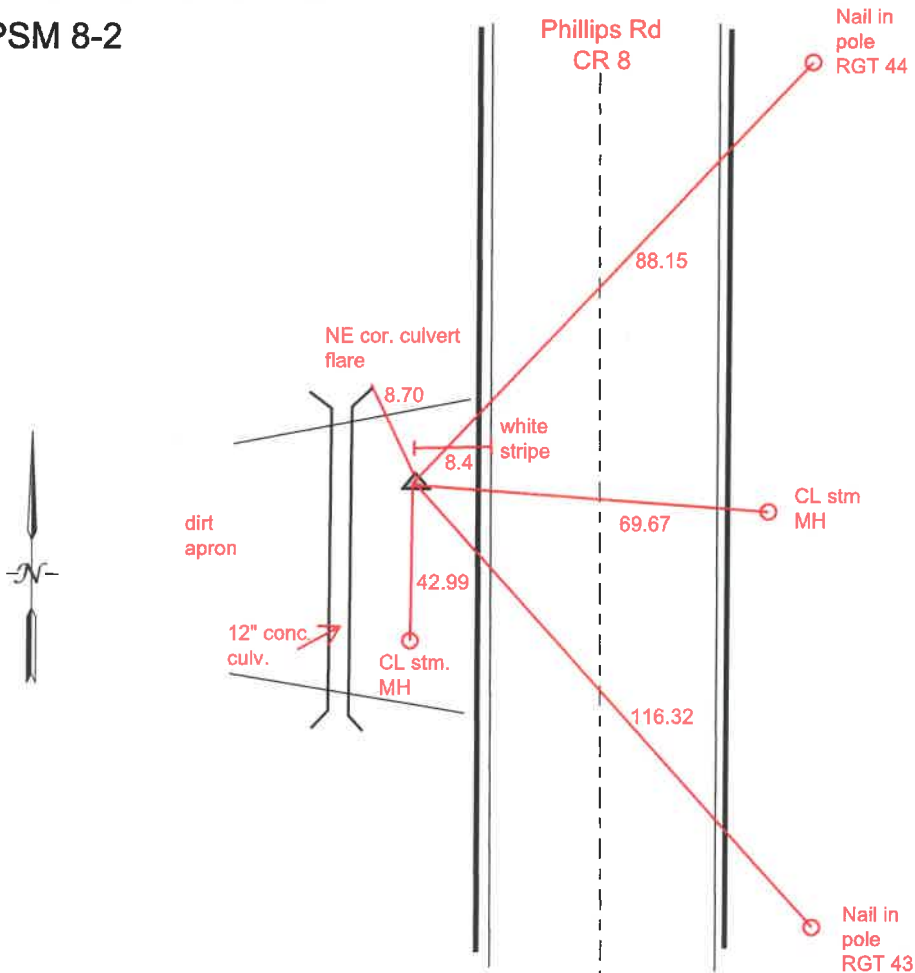
HORIZONTAL DATUM: <u>NAD 1983 (2011)</u>	NYS PLANE COORDINATE SYSTEM ZONE: <u>West (3013)</u>		
GRID NORTHING (Y): <u>1184430.821</u>	DISTANCE & DIRECTION TO PRECEDING & SUCCEEDING PSM		
GRID EASTING (X): <u>1458341.078</u>	PSM NUMBER	DISTANCE	AZIMUTH
COMBINED FACTOR: <u>1.00003734</u>	PSM 8-1	839.458	178°12'51"
VERTICAL DATUM: <u>NAVD 88 (NYSNET)</u>	PSM 8-3	1474.964	358°03'31"
ORTHOMETRIC ELEVATION: <u>344.772</u>			

**MONUMENT LOCATION AND DETAILED MATERIAL DESCRIPTION**

MCDOT standard 3" brass disk in concrete set 2" below grade. Magnetic traceable. Phillips Rd. Centerline station 112+88.3, 19.4'L, approx. 615' north of hse. #481. Stamped "PSM 8-2"

**SKETCH OF MARKER WITH TIES**

**PSM 8-2**



Not to scale  
All dimensions in feet  
All ties measured horizontal

**MONROE COUNTY DEPARTMENT OF TRANSPORTATION  
"ROAD NAME" HIGHWAY PROJECT  
PERMANENT SURVEY MARKER PSM 8-3**

**Phillips Road- County Rte. 8 Improvements  
from Schlegel Rd (CR3) to Lake Rd (CR1)  
Town of Webster, Monroe Cty. , NY  
CIP No. 1709**



**SURVEY CERTIFICATION**

I hereby certify that the Permanent Survey Marker listed hereon was installed and positioned in accordance with and to the degree of accuracy required by Section C625.06 of the Monroe County Department of Transportation Standard specifications, and that the marker is within a horizontal positional closure of 1:66880'. based on existing project monumentation and/or data.

Signed: *Neal R. Klettke* Date: 12-18-2019

**Neal R. Klettke, PLS**  
New York State Licensed Land Surveyor # 049505

ALL UNITS ARE ENGLISH AND U.S. SURVEY FEET

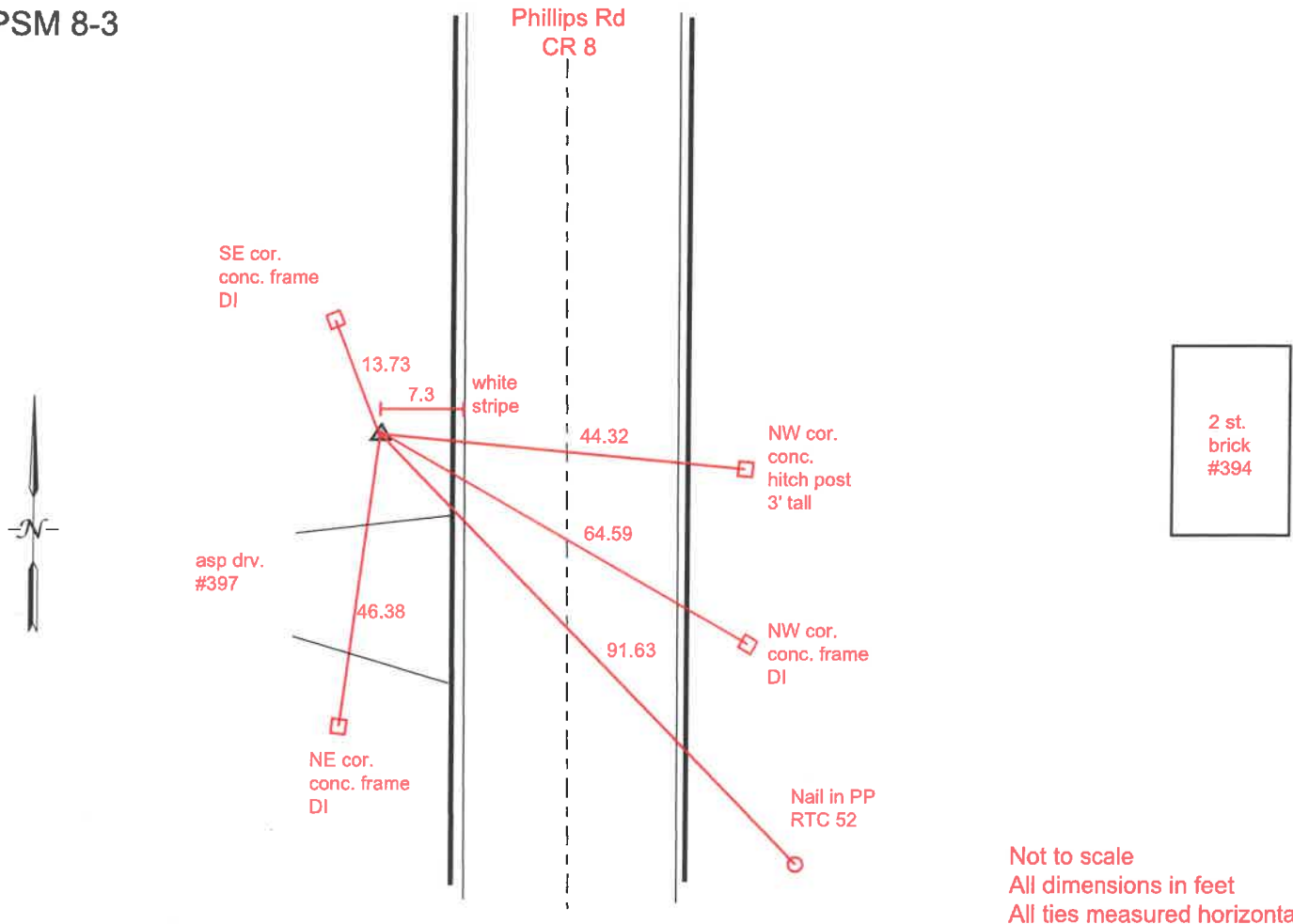
HORIZONTAL DATUM: <u>NAD 1983 (2011)</u>	NYS PLANE COORDINATE SYSTEM ZONE: <u>West (3013)</u>		
GRID NORTHING (Y): <u>1185904.938</u>	DISTANCE & DIRECTION TO PRECEDING & SUCCEEDING PSM		
GRID EASTING (X): <u>1458291.112</u>	PSM NUMBER	DISTANCE	AZIMUTH
COMBINED FACTOR: <u>1.00003734</u>	PSM 8-2	1474.964	178°03'31"
VERTICAL DATUM: <u>NAVD 88 (NYSNET)</u>	PSM 8-4	1571.862	359°41'27"
ORTHOMETRIC ELEVATION: <u>338.826</u>			

**MONUMENT LOCATION AND DETAILED MATERIAL DESCRIPTION**

MCDOT standard 3" brass disk in concrete set 1.5" above grade. Magnetic traceable. Phillips Rd. Centerline station 127+63.5, 18.4'L, opposite hse. #394. Stamped "PSM 8-3".

**SKETCH OF MARKER WITH TIES**

**PSM 8-3**



Not to scale  
All dimensions in feet  
All ties measured horizontal

**MONROE COUNTY DEPARTMENT OF TRANSPORTATION  
"ROAD NAME" HIGHWAY PROJECT  
PERMANENT SURVEY MARKER**

**PSM 8-4**

**Phillips Road- County Rte. 8 Improvements  
from Schlegel Rd (CR3) to Lake Rd (CR1)  
Town of Webster, Monroe Cty. , NY  
CIP No. 1709**



**SURVEY CERTIFICATION**

I hereby certify that the Permanent Survey Marker listed hereon was installed and positioned in accordance with and to the degree of accuracy required by Section C625.06 of the Monroe County Department of Transportation Standard specifications, and that the marker is within a horizontal positional closure of 1:66880'. based on existing project monumentation and/or data.

Signed: Neal R. Klettke Date: 12-18-2019

**Neal R. Klettke, PLS**  
New York State Licensed Land Surveyor # **049505**

ALL UNITS ARE ENGLISH AND U.S. SURVEY FEET

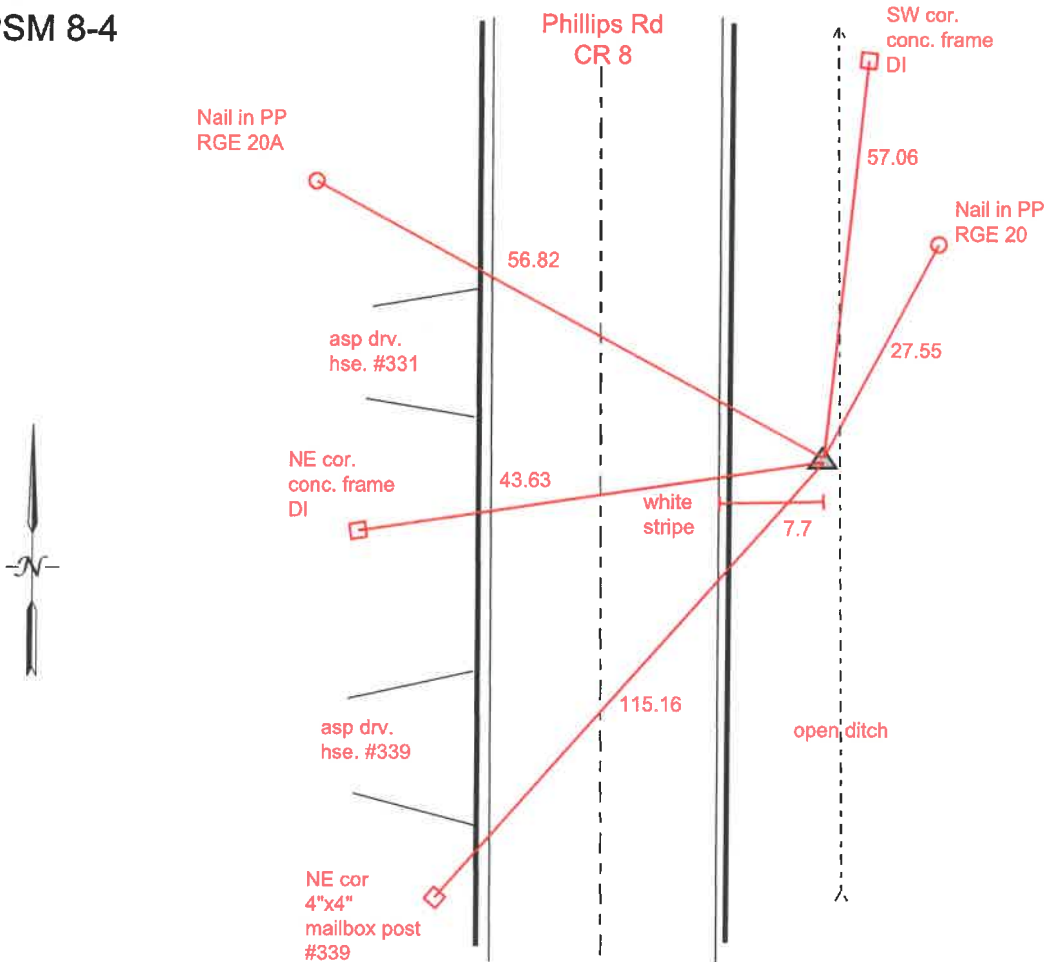
HORIZONTAL DATUM: <u>NAD 1983 (2011)</u>	NYS PLANE COORDINATE SYSTEM ZONE: <u>West (3013)</u>		
GRID NORTHING (Y): <u>1187476.777</u>	DISTANCE & DIRECTION TO PRECEDING & SUCCEEDING PSM		
GRID EASTING (X): <u>1458282.627</u>	PSM NUMBER	DISTANCE	AZIMUTH
COMBINED FACTOR: <u>1.00003734</u>	PSM 8-3	1571.862	179°41'27"
VERTICAL DATUM: <u>NAVD 88 (NYSNET)</u>	PSM 8-5	1526.504	358°11'08"
ORTHOMETRIC ELEVATION: <u>325.630</u>			

**MONUMENT LOCATION AND DETAILED MATERIAL DESCRIPTION**

MCDOT standard 3" brass disk in concrete set 1.5" above grade flush. Magnetic traceable. Phillips Rd. Centerline station 143+34.8, 18.5'R, opposite hse. 339 and 331, Stamped "PSM 8-4"

**SKETCH OF MARKER WITH TIES**

**PSM 8-4**



Not to scale  
All dimensions in feet  
All ties measured horizontal

**MONROE COUNTY DEPARTMENT OF TRANSPORTATION**

**"ROAD NAME" HIGHWAY PROJECT**

**PERMANENT SURVEY MARKER PSM 8-5**

Phillips Road- County Rte. 8 Improvements  
from Schlegel Rd (CR3) to Lake Rd (CR1)  
Town of Webster, Monroe Cty. , NY  
CIP No. 1709



**SURVEY CERTIFICATION**

I hereby certify that the Permanent Survey Marker listed hereon was installed and positioned in accordance with and to the degree of accuracy required by Section C625.06 of the Monroe County Department of Transportation Standard specifications, and that the marker is within a horizontal positional closure of 1:66880' based on existing project monumentation and/or data.

Signed: Neal R. Klettke Date: 12-18-2019

**Neal R. Klettke, PLS**  
New York State Licensed Land Surveyor # **049505**

ALL UNITS ARE ENGLISH AND U.S. SURVEY FEET

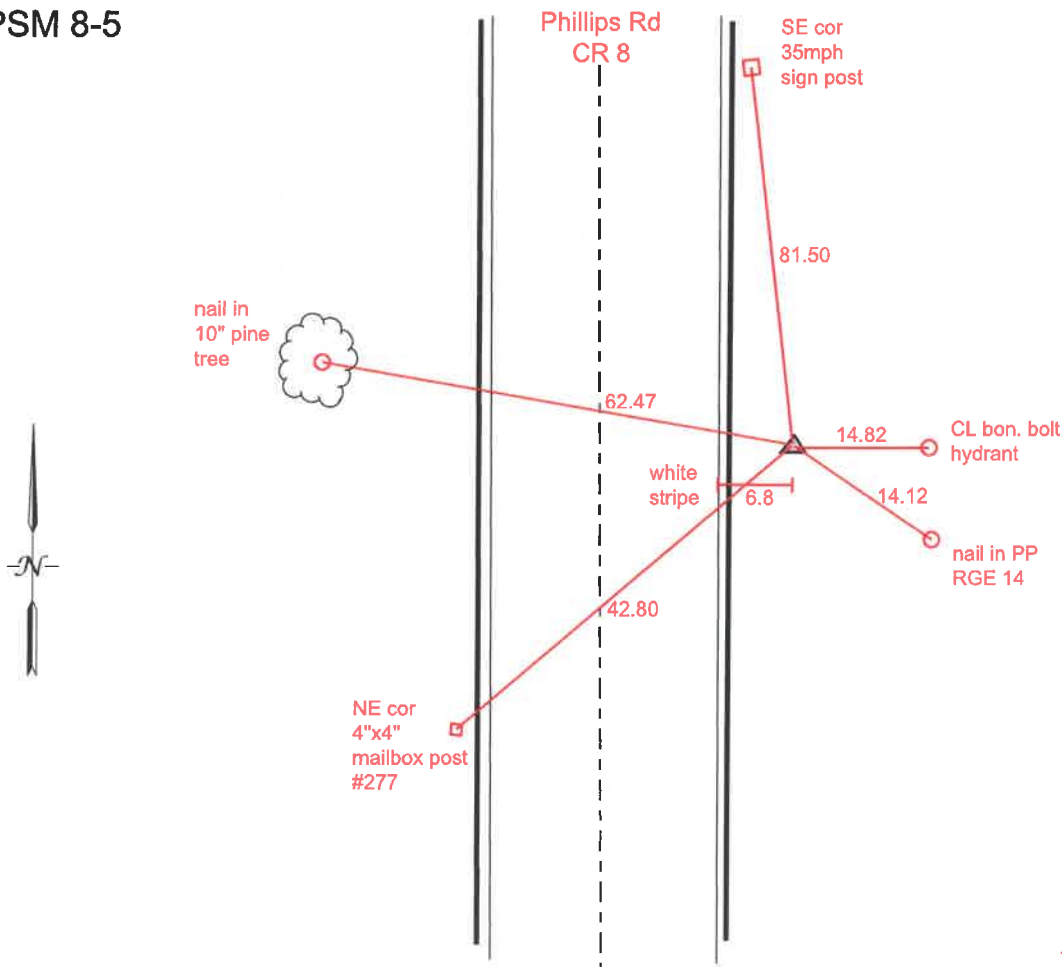
HORIZONTAL DATUM: <b>NAD 1983 (2011)</b>		NYS PLANE COORDINATE SYSTEM ZONE: <b>West (3013)</b>	
GRID NORTHING (Y): <b>1189002.516</b>	DISTANCE & DIRECTION TO PRECEEDING & SUCCEEDING PSM		
GRID EASTING (X): <b>1458234.294</b>	PSM NUMBER	DISTANCE	AZIMUTH
COMBINED FACTOR: <b>1.00003734</b>	<b>PSM 8-4</b>	<b>1526.504</b>	<b>178°11'08"</b>
VERTICAL DATUM: <b>NAVD 88 (NYSNET)</b>	<b>PSM 8-6</b>	<b>1466.123</b>	<b>356°47'22"</b>
ORTHOMETRIC ELEVATION: <b>313.676</b>			

**MONUMENT LOCATION AND DETAILED MATERIAL DESCRIPTION**

MCDOT standard 3" brass disk in concrete set flush. Magnetic traceable. Phillips Rd. Centerline station 158+61.2, 17.6R, approx. 146' north of hse. #280. Stamped "PSM 8-5"

**SKETCH OF MARKER WITH TIES**

**PSM 8-5**



Not to scale  
All dimensions in feet  
All ties measured horizontal

**MONROE COUNTY DEPARTMENT OF TRANSPORTATION  
"ROAD NAME" HIGHWAY PROJECT  
PERMANENT SURVEY MARKER**

**PSM 8-6**

**Phillips Road- County Rte. 8 Improvements  
from Schlegel Rd (CR3) to Lake Rd (CR1)  
Town of Webster, Monroe Cty., NY  
CIP No. 1709**



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Signed: Neal R. Klettke

Date: 12-13-2019

**Neal R. Klettke, PLS**  
New York State Licensed Land Surveyor # **049505**

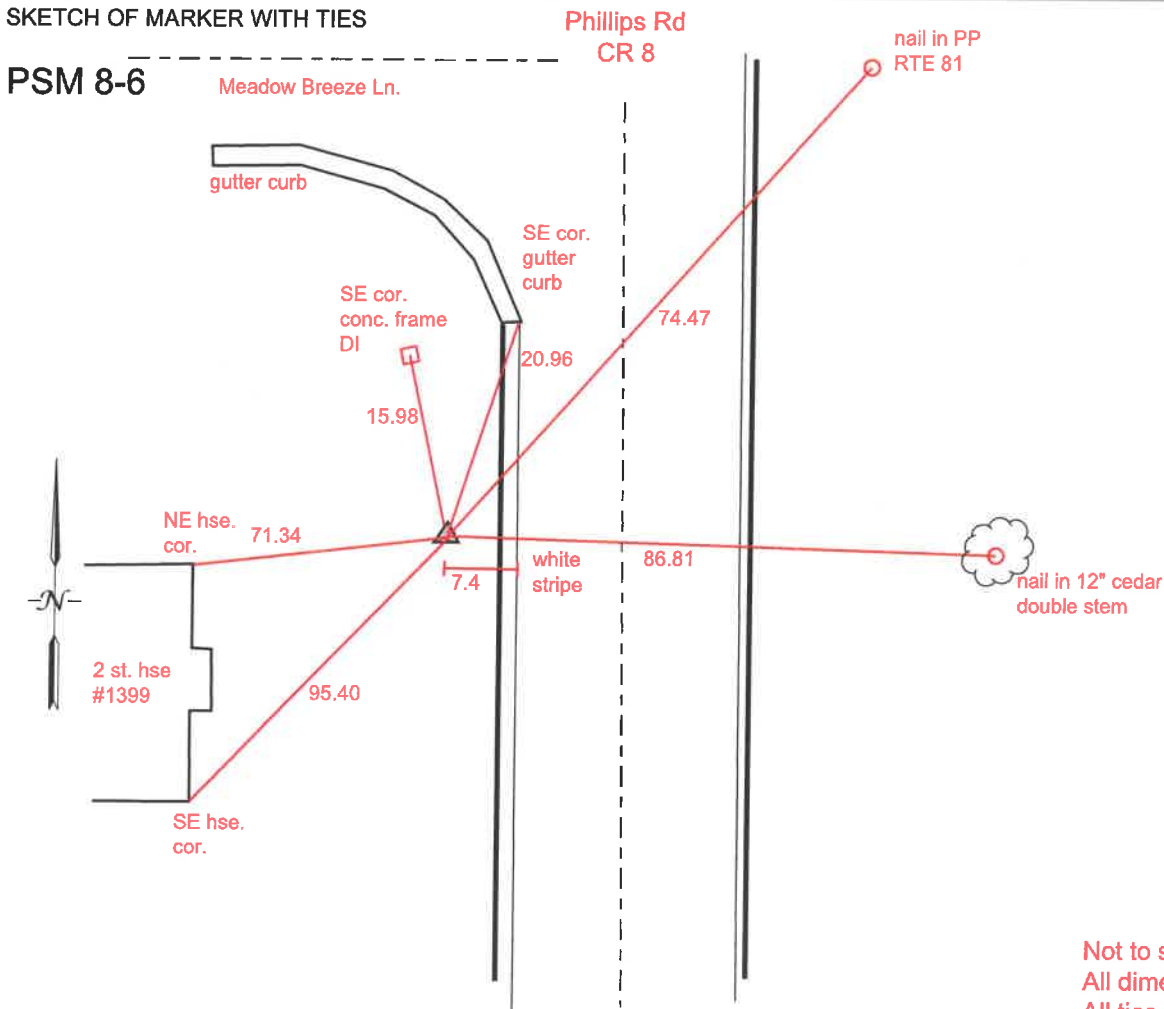
ALL UNITS ARE ENGLISH AND U.S. SURVEY FEET

HORIZONTAL DATUM: <u>NAD 1983 (2011)</u>	NYS PLANE COORDINATE SYSTEM ZONE: <u>West (3013)</u>		
GRID NORTHING (Y): <u>1190466.338</u>	DISTANCE & DIRECTION TO PRECEEDING & SUCCEEDING PSM		
GRID EASTING (X): <u>1458152.180</u>	PSM NUMBER	DISTANCE	AZIMUTH
COMBINED FACTOR: <u>1.00003734</u>	PSM 8-5	1466.123	176°47'22"
VERTICAL DATUM: <u>NAVD 88 (NYSNET)</u>	PSM 8-7	1443.639	0°13'08"
ORTHOMETRIC ELEVATION: <u>305.585</u>			

**MONUMENT LOCATION AND DETAILED MATERIAL DESCRIPTION**

MCDOT standard 3" brass disk in concrete set 0.6' above grade. Magnetic traceable. Phillips Rd. Centerline station 173+26.9, 18.4L, approx. 50' south of intersection Meadow Breeze Ln., Stamped "PSM 8-6".

**SKETCH OF MARKER WITH TIES**



Not to scale  
All dimensions in feet  
All ties measured horizontal

**MONROE COUNTY DEPARTMENT OF TRANSPORTATION  
"ROAD NAME" HIGHWAY PROJECT  
PERMANENT SURVEY MARKER PSM 8-7**

Phillips Road- County Rte. 8 Improvements  
from Schlegel Rd (CR3) to Lake Rd (CR1)  
Town of Webster, Monroe Cty. , NY  
CIP No. 1709



**SURVEY CERTIFICATION**

I hereby certify that the Permanent Survey Marker listed hereon was installed and positioned in accordance with and to the degree of accuracy required by Section C625.06 of the Monroe County Department of Transportation Standard specifications, and that the marker is within a horizontal positional closure of 1:66880' based on existing project monumentation and/or data.

Signed: Neal R. Klettke Date: 12-19-2019

**Neal R. Klettke, PLS**  
New York State Licensed Land Surveyor # **049505**

ALL UNITS ARE ENGLISH AND U.S. SURVEY FEET

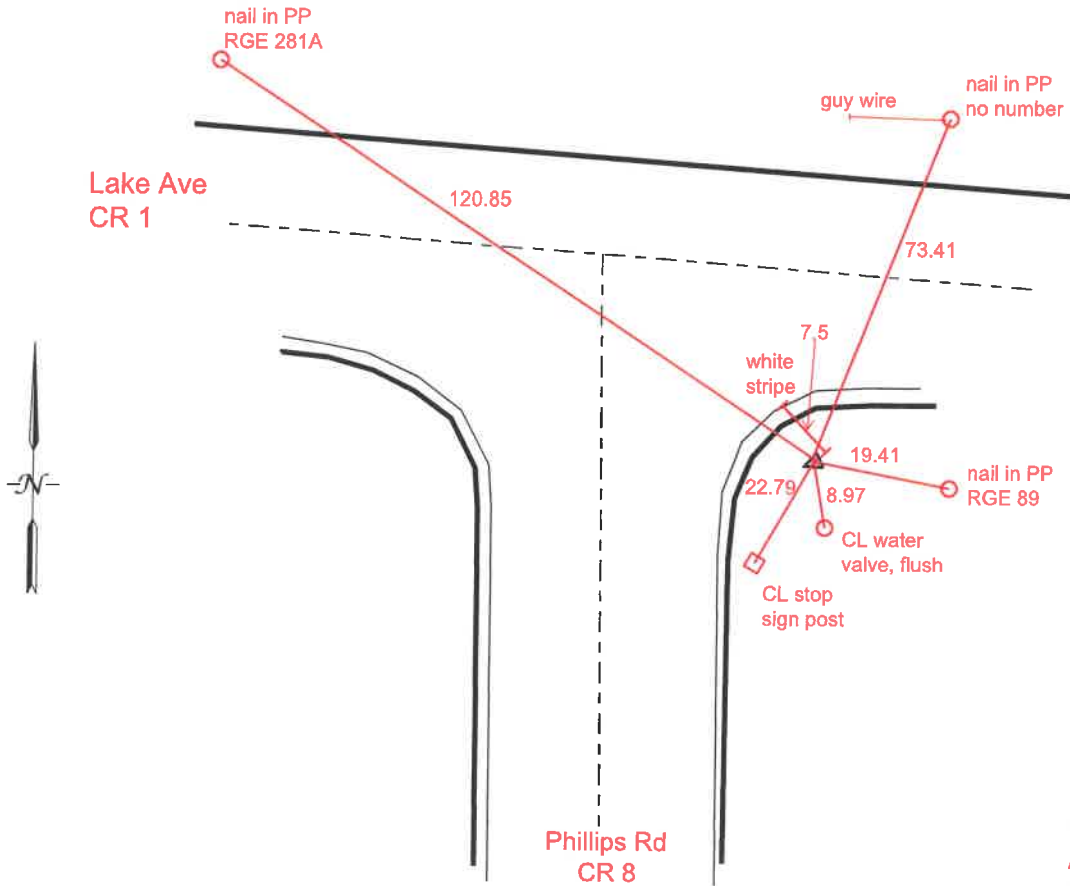
HORIZONTAL DATUM: <u>NAD 1983 (2011)</u>		NYS PLANE COORDINATE SYSTEM ZONE: <u>West (3013)</u>	
GRID NORTHING (Y): <u>1191909.966</u>	DISTANCE & DIRECTION TO PRECEEDING & SUCCEEDING PSM		
GRID EASTING (X): <u>1458157.692</u>	PSM NUMBER	DISTANCE	AZIMUTH
COMBINED FACTOR: <u>1.00003734</u>	PSM 8-6	1443.639	180°13'08"
VERTICAL DATUM: <u>NAVD 88 (NYSNET)</u>	exist. CBP-10	1154.171	275°08'02"
ORTHOMETRIC ELEVATION: <u>289.820</u>			

**MONUMENT LOCATION AND DETAILED MATERIAL DESCRIPTION**

MCDOT standard 3" brass disk in concrete set 2" below grade. Magnetic traceable. Phillips Rd. Centerline station 187+69.7, 30.9R, at SE cor. inter. Phillips and Lake Roads, Stamped "PSM 8-7".

**SKETCH OF MARKER WITH TIES**

**PSM 8-7**



Not to scale  
All dimensions in feet  
All ties measured horizontal

Project File Data		Coordinate System	
Name:	S:\Zoladz\Estimating\2018 Job Folder\18-004-C Phillips Road Reconstruction\Survey\Phillips Rd. uts traverse2.vce	Name:	Scale Only
Size:	73 KB	Datum:	
Modified:	12/12/2019 10:30:57 AM (UTC:-5)	Zone:	
Time zone:	Eastern Standard Time	Geoid:	
Reference number:		Vertical datum:	
Description:		Calibrated site:	
Comment 1:			
Comment 2:			
Comment 3:			

## Alignment Geometry Report

Alignment: PSM align						
Units	Length	Spiral Type		Northing	Easting	Station
US survey foot	10228.288	Clothoid	POB	1182840.214	1458371.151	0+00.00
Line						
North Azimuth	Distance			Northing	Easting	Station
359°42'07"	751.567	cbp2 PT		1182840.214	1458371.151	0+00.00
		8-1 PI		1183591.771	1458367.240	7+51.57
Line						
North Azimuth	Distance			Northing	Easting	Station
358°12'51"	839.458	8-1 PI		1183591.771	1458367.240	7+51.57
		8-2 PI		1184430.821	1458341.078	15+91.02
Line						
North Azimuth	Distance			Northing	Easting	Station
358°03'31"	1474.964	8-2 PI		1184430.821	1458341.078	15+91.02
		8-3 PI		1185904.938	1458291.112	30+65.99
Line						
North Azimuth	Distance			Northing	Easting	Station
359°41'27"	1571.862	8-3 PI		1185904.938	1458291.112	30+65.99
		8-4 PI		1187476.777	1458282.627	46+37.85
Line						
North Azimuth	Distance			Northing	Easting	Station
358°11'08"	1526.504	8-4 PI		1187476.777	1458282.627	46+37.85
		8-5 PI		1189002.516	1458234.294	61+64.35
Line						



Line					
North Azimuth	Distance		Northing	Easting	Station
356°47'22"	1466.123	8-5			
		PI	1189002.516	1458234.294	61+64.35
		8-6			
		PI	1190466.338	1458152.180	76+30.48

Line					
North Azimuth	Distance		Northing	Easting	Station
0°13'08"	1443.639	8-6			
		PI	1190466.338	1458152.180	76+30.48
		8-7			
		PI	1191909.966	1458157.692	90+74.12

Line					
North Azimuth	Distance		Northing	Easting	Station
275°08'02"	1154.171	8-7			
		PI	1191909.966	1458157.692	90+74.12
		cbp10			
		PT	1192013.246	1457008.151	102+28.29

Vertical Alignment: PSM align_V					
			VPOB	Station	Elevation
			cbp2	0+00.00	354.680

Vertical point of intersection					
Approach grade	Departure grade	VPI		Station	Elevation
-0.927 %	-0.350 %	8-1		7+51.57	347.711

Vertical point of intersection					
Approach grade	Departure grade	VPI		Station	Elevation
-0.350 %	-0.403 %	8-2		15+91.02	344.772

Vertical point of intersection					
Approach grade	Departure grade	VPI		Station	Elevation
-0.403 %	-0.840 %	8-3		30+65.99	338.826

Vertical point of intersection					
Approach grade	Departure grade	VPI		Station	Elevation
-0.840 %	-0.783 %	8-4		46+37.85	325.630

Vertical point of intersection					
Approach grade	Departure grade	VPI		Station	Elevation
-0.783 %	-0.552 %	8-5		61+64.35	313.676

Vertical point of intersection					
Approach grade	Departure grade	VPI		Station	Elevation
		8-6		76+30.48	305.585

<b>Vertical point of intersection</b>					
	-0.552 %	-1.092 %			
<b>Vertical point of intersection</b>					
	<b>Approach grade</b>	<b>Departure grade</b>	<b>VPI</b>	<b>Station</b>	<b>Elevation</b>
	-1.092 %		8-7	90+74.12	289.820

Date: 12/12/2019 11:06:55 AM	Project: S:\Zoladz\Estimating\2018 Job Folder\18-004-C Phillips Road Reconstruction\Survey\Phillips Rd. uts traverse2.vce	Trimble Business Center
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PSM Traverse, Phillips Rd. Monroe County Project 1709

Raw Data Report, field measure 7-10-19

revised, add measurement precision columns 12-9-19

Observation ID	Status	1st Backsight ID	From Point ID	To Point ID	H. Angle	V. Angle	Azimuth	H. Distance	V. Distance	True Instrument Height	True Target Height	H. Precision (95%) $\pm$ sigma	V. Precision (95%) $\pm$ sigma	
T752	Enabled	cbp1	cbp2	cbp1	0°00'00"	Z89°15'38.0"	178°20'57"	?	19.235	5.50	4.77	?	?	
T753	Enabled	cbp1	cbp2	cbp1	0°00'00"	Z89°15'38.7"	178°20'55"	?	19.231	5.50	4.77	?	?	
T754	Enabled	cbp1	cbp2	1-Aug	181°21'04"	Z90°31'02.2"	359°42'00"	751.514	-6.923	5.50	5.65	0.024	0.028	
T755	Enabled	cbp1	cbp2	1-Aug	181°21'06"	Z90°31'03.8"	359°42'01"	751.514	-6.929	5.50	5.65	0.024	0.028	
T756	Enabled	cbp2	cbp2	8/1 cbp2	0°00'00"	Z89°34'34.7"	179°42'01"	751.551	6.999	5.78	4.35	0.024	0.028	
T757	Enabled	cbp2	cbp2	8/1 cbp2	0°00'00"	Z89°34'36.3"	179°42'00"	751.551	6.993	5.78	4.35	0.024	0.028	
T758	Enabled	cbp2	cbp2	8/1	8/2	178°30'44"	Z90°14'06.2"	358°12'45"	839.406	-2.929	5.78	5.28	0.024	0.028
T759	Enabled	cbp2	cbp2	8/1	8/2	178°30'43"	Z90°14'08.5"	358°12'43"	839.406	-2.938	5.78	5.28	0.024	0.028
T760	Enabled	cbp2	cbp2	8/1	8/2	178°30'44"	Z90°14'06.2"	358°12'45"	839.429	2.932	5.39	5.65	0.024	0.028
T761	Enabled	cbp2	cbp2	8/1	8/2	178°30'43"	Z90°14'08.5"	358°12'43"	839.429	2.928	5.39	5.65	0.024	0.028
T762	Enabled	cbp2	cbp2	8/1	8/2	179°50'42"	Z90°13'19.6"	358°03'25"	839.43	2.928	5.39	5.65	0.024	0.028
T763	Enabled	cbp2	cbp2	8/1	8/2	179°50'42"	Z90°13'18.3"	358°03'23"	1474.902	-5.933	5.39	5.65	0.024	0.03
T764	Enabled	cbp2	cbp2	8/2	8/3	179°50'37"	Z90°13'18.3"	358°03'23"	1474.9	-5.923	5.39	5.65	0.024	0.03
T765	Enabled	cbp2	cbp2	8/2	8/3	179°50'37"	Z90°13'18.3"	358°03'23"	1474.9	-5.923	5.39	5.65	0.024	0.03
T766	Enabled	cbp2	cbp2	8/2	8/3	179°50'37"	Z90°13'18.3"	358°03'23"	1474.89	5.933	5.78	5.26	0.024	0.03
T767	Enabled	cbp2	cbp2	8/2	8/3	179°50'37"	Z90°13'18.3"	358°03'23"	1474.889	5.938	5.78	5.26	0.024	0.03
T768	Enabled	cbp2	cbp2	8/2	8/3	181°37'53"	Z90°30'44.1"	359°41'17"	1571.793	-13.202	5.78	4.98	0.025	0.031
T769	Enabled	cbp2	cbp2	8/3	8/4	181°37'53"	Z90°30'44.1"	359°41'17"	1571.793	-13.202	5.78	4.98	0.025	0.031
T770	Enabled	cbp2	cbp2	8/3	8/4	181°37'53"	Z90°30'46.1"	359°41'20"	1571.792	-13.217	5.78	4.98	0.025	0.031
T771	Enabled	cbp2	cbp2	8/3	8/4	181°37'53"	Z90°30'46.1"	359°41'20"	1571.792	-13.217	5.78	4.98	0.025	0.031
T772	Enabled	cbp2	cbp2	8/3	8/4	181°37'53"	Z90°30'46.1"	359°41'20"	1571.792	-13.217	5.78	4.98	0.025	0.031
T773	Enabled	cbp2	cbp2	8/3	8/4	181°37'53"	Z90°30'46.1"	359°41'20"	1571.783	13.169	5.11	5.65	0.025	0.031
T774	Enabled	cbp2	cbp2	8/3	8/4	181°37'53"	Z90°30'46.1"	359°41'20"	1571.783	13.139	5.11	5.65	0.025	0.031
T775	Enabled	cbp2	cbp2	8/3	8/4	181°37'53"	Z90°30'46.1"	359°41'20"	1526.43	11.908	5.11	6.12	0.025	0.031
T776	Enabled	cbp2	cbp2	8/3	8/4	181°37'53"	Z90°30'46.1"	359°41'20"	1526.431	-11.951	5.11	6.12	0.025	0.031
T777	Enabled	cbp2	cbp2	8/3	8/4	181°37'53"	Z90°30'46.1"	359°41'20"	1526.433	11.92	5.42	5.81	0.025	0.031
T778	Enabled	cbp2	cbp2	8/3	8/4	181°37'53"	Z90°30'46.1"	359°41'20"	1466.061	-8.056	5.42	5.26	0.024	0.03
T779	Enabled	cbp2	cbp2	8/5	8/6	178°36'13"	Z90°19'22.2"	356°47'11"	1466.051	8.1	5.30	5.30	0.024	0.03
T780	Enabled	cbp2	cbp2	8/5	8/6	178°36'13"	Z90°19'22.2"	356°47'11"	1466.054	8.098	5.30	5.30	0.024	0.03
T781	Enabled	cbp2	cbp2	8/5	8/6	178°36'13"	Z90°19'22.2"	356°47'11"	543.446	-3.812	5.39	5.71	0.024	0.028
T782	Enabled	cbp2	cbp2	8/5	8/6	178°36'13"	Z90°19'22.2"	356°47'11"	543.445	-3.821	5.39	5.71	0.024	0.028
T783	Enabled	cbp2	cbp2	8/5	8/6	178°36'13"	Z90°19'22.2"	356°47'11"	543.448	6.828	5.82	5.26	0.024	0.028
T784	Enabled	cbp2	cbp2	8/5	8/6	178°36'13"	Z90°19'22.2"	356°47'11"	543.447	6.83	5.82	5.26	0.024	0.028
T785	Enabled	cbp2	cbp2	8/5	8/6	178°36'13"	Z90°19'22.2"	356°47'11"	900.401	-8.924	5.44	5.44	0.024	0.029
T786	Enabled	cbp2	cbp2	8/5	8/6	178°36'13"	Z90°19'22.2"	356°47'11"	900.4	-8.928	5.44	5.44	0.024	0.029
T787	Enabled	cbp2	cbp2	8/5	8/6	178°36'13"	Z90°19'22.2"	356°47'11"	900.398	12.085	5.56	5.56	0.024	0.029
T788	Enabled	cbp2	cbp2	8/5	8/6	178°36'13"	Z90°19'22.2"	356°47'11"	900.397	12.077	5.56	5.56	0.024	0.029
T789	Enabled	cbp2	cbp2	8/5	8/6	178°36'13"	Z90°19'22.2"	356°47'11"	1154.14	3.161	5.55	5.55	0.024	0.029
T790	Enabled	cbp2	cbp2	8/5	8/6	178°36'13"	Z90°19'22.2"	356°47'11"	1154.14	3.177	5.55	5.55	0.024	0.029
T791	Enabled	cbp2	cbp2	8/5	8/6	178°36'13"	Z90°19'22.2"	356°47'11"	1154.142	-3.249	5.68	5.45	0.024	0.029
T792	Enabled	cbp2	cbp2	8/5	8/6	178°36'13"	Z90°19'22.2"	356°47'11"	1154.14	-3.241	5.68	5.45	0.024	0.029
T793	Enabled	cbp2	cbp2	8/5	8/6	178°36'13"	Z90°19'22.2"	356°47'11"	1109.365	-4.137	5.68	5.43	0.024	0.029
T794	Enabled	cbp2	cbp2	8/5	8/6	178°36'13"	Z90°19'22.2"	356°47'11"	1109.362	-4.128	5.68	5.43	0.024	0.029



**Zoladz Construction Co., Inc.**  
 13600 Railroad Street • PO Box 157 • Alden, NY 14004-0157  
 Telephone: 716-937-6575  
 Fax: 716-937-6369

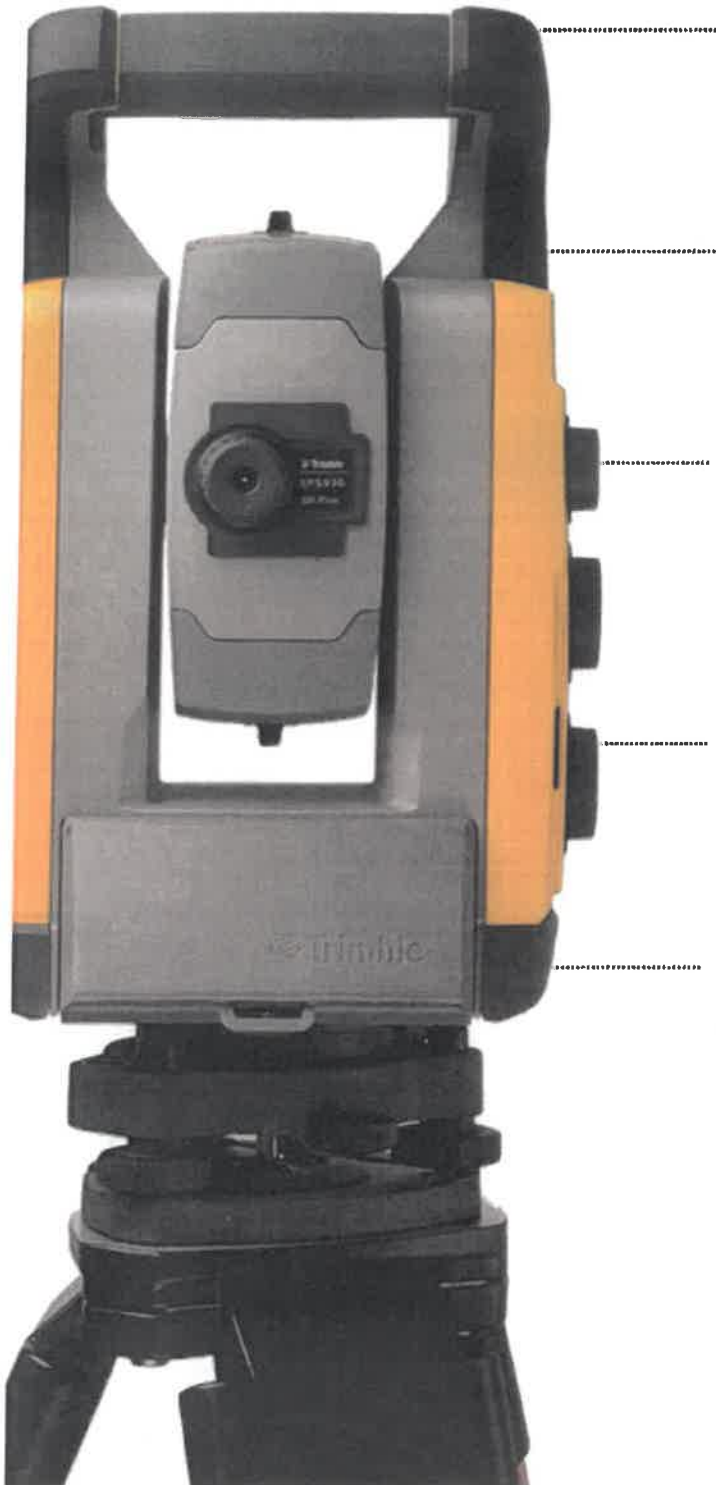
SITE WORK  
 UTILITY WORK  
 LANDFILLS  
 LAND CLEARING  
 ASPHALT PAVING  
 DEMOLITION  
 CRUSHING/RECYCLING  
 HAULING/LAWBOY SERVICES

JOB 18-004-C  
 PHILLIA RD. PSM TRAV.

Pg. 7 7-10-19  
 NC. - RD

X @	CBD-2	BS	CBD-1	<sup>RT</sup> \$ RT TO	PSM B-1	
X	5.50	BS	5.77	FS	5.65	NOTES
X @	B-1	BS	CBD-2	<sup>RT</sup> \$ RT TO	PSM B-2	
X	5.78	BS	5.28	FS	5.28	
			4.355			
X @	B-2	BS	B-1	<sup>RT</sup> \$ RT TO	PSM B-2	
X	5.39	BS	5.65	FS	5.65	
X @	B-3	BS	B-2	<sup>RT</sup> \$ RT TO	PSM B-4	
X	5.78	BS	5.25	FS	4.98	
X @	B-4	BS	B-3	\$ RT TO	PSM B-5	
X	5.11	BS	5.15	FS	<del>5.15</del> 4.15	
					6.12	
X @	B-5	BS	B-4	\$ RT TO	PSM B-6	
X	5.42	BS	5.81	FS	5.26	
X @	B-6	BS	B-5	\$ RT TO	TR-1	
X	<del>5.35</del> 5.39	BS	5.30	FS	<del>4.51</del> 10.91 5.71	
X @	<sup>TR-1</sup> <del>B-7</del>	BS	B-6	\$ RT TO	B-7	
X	5.82	BS	5.26	FS	5.44	
X @	<sup>B-7</sup> CSP-10	BS	TR-1	\$ RT TO	CSP-10	
X	5.56	BS	5.71	FS	5.55	
X @	CSP-10	BS	B-7	\$ RT TO	CSP-9/21	
X	5.68	BS	5.45	FS	5.45	

~~5.5~~ 4.10  
~~6.21~~ 4



**ROBOTIC, REFLECTORLESS AND MACHINE CONTROL FEATURES SATISFY ALL SITE POSITIONING AND MACHINE CONTROL NEEDS**

**INDUSTRY-LEADING 20 HZ DYNAMIC POSITIONING UPDATE RATE**

**ACTIVE TARGET FUNCTION GUARANTEES RELIABLE LOCK ON THE CORRECT TARGET**

**DR PLUS LONG-RANGE REFLECTORLESS MEASUREMENTS ELIMINATE THE RISK AND DELAY OF WALKING THE SURFACE WITH A TARGET**

**TRIMBLE MAGDRIVE SERVOS PROVIDE UNMATCHED INSTRUMENT TURNING AND TRACKING SPEEDS**

**THE ALL-IN-ONE, UNIVERSAL TOTAL STATION**

The Trimble® SPS630, SPS730 and SPS930 Universal Total Stations can tackle any measurement, stakeout or machine control task on the job site— all from the same instrument. Universal Total Stations are packed with market leading features such as:

- Long life integrated batteries for a full day of interrupted work
- Bluetooth for cable free operation
- Choice of Trimble TSC3, Trimble Tablet, and TCU controllers to suit your site needs
- Intuitive SCS900 Site Controller Software
- Optional machine control mode

These features make the Universal Total Stations easy to use for all your jobsite needs. No matter what job you are doing, SPS total stations will deliver unmatched user experience, all round capability and incredible results.

**DR Plus Long-Range Reflectorless Measurement**

The DR Plus™ long-range reflectorless measurement capability allows you to measure hard-to-reach or unsafe places up to 2 kilometers (1.2 miles) away. There is no need to walk the surface with a target, so you'll increase productivity and safety when measuring stockpiles, profiling cuttings and rock faces.

**Trimble MultiTrack Technology**

Trimble MultiTrack™ technology locks on and tracks passive prisms for monitoring or control measurements and active targets for dynamic measurement, stakeout and grade control. Active targets guarantee lock to the correct target, especially in dusty construction site conditions. Up to 16 unique channels of target identification can be used to differentiate survey crews and grade checkers from machines eliminating down time caused by unnecessary interference.

**Unmatched Dynamic Positioning**

Trimble's patented MagDrive™ servo technology utilizes magnetic levitation to eliminate friction. Fast response time and fast servos allow the instrument to change direction, and track more reliably. Trimble Universal Total Stations can provide highly accurate machine guidance for excavation, grading, compaction, milling, and paving projects. Using the same Trimble total station, your machines can work to tight construction tolerances, save expensive materials, avoid rework and get to grade faster.



The Construction Technology Standard  
[www.trimble.com](http://www.trimble.com)

# TRIMBLE UNIVERSAL TOTAL STATION

## ANGLE MEASUREMENT

Horizontal Accuracy SPS630, SPS730, SPS930  
 Standard deviation based on DIN 18723 .....5", 3", 1" (1.5, 1.0, 0.3 mgon)  
 Vertical Accuracy SPS630, SPS730, SPS930  
 Standard deviation based on DIN 18723 .....5", 2", 1" (1.5, 0.6, 0.3 mgon)  
 Angle Reading (least count)  
 Standard mode .....1" (0.3 mgon)  
 Tracking mode .....2" (0.6 mgon)  
 Dual-axis compensator ..... ±6' (±100 mgon)

## DISTANCE MEASUREMENT ACCURACY

Prism Mode  
 Standard mode ..... ±(2 mm + 2 ppm) ±(0.0065 ft + 2 ppm)  
 Tracking mode<sup>1</sup> ..... ±(4 mm + 2 ppm) ±(0.013 ft + 2 ppm)  
 Synchronized angle and distance measurements ..... Yes  
 Position update rate ..... Up to 20Hz  
 DR Reflectorless Mode  
 Standard mode ..... ±(2 mm + 2 ppm) ±(0.0065 ft + 2 ppm)  
 Scanning mode ..... ±(4 mm + 2 ppm) ±(0.013 ft + 2 ppm)

## MEASUREMENT RANGE

Prism Mode (under clear conditions<sup>2</sup>)  
 1 prism ..... 2,500 m (8,202 ft)  
 1 prism (long range mode) ..... 5,500 m (18,044 ft)  
 DR Reflectorless Mode<sup>4</sup>  
 Kodak Gray Card (18% reflective) ..... >600 m (1969 ft)  
 Kodak Gray Card (90% reflective) ..... >1300 m (4265 ft)  
 Servo system ..... MagDrive servo technology, integrated servo/angle sensor, electromagnetic direct drive  
 Rotation speed ..... 115 degrees/sec (128 gon/sec)  
 Clamps and slow motions ..... Servo-driven, endless fine adjustment  
 Positioning speed 180 degrees (200 gon) ..... 3.2 sec

## TELESCOPE

Magnification ..... 30x  
 Field of view ..... 2.6 m at 100 m (8.5 ft at 328 ft)  
 Shortest focusing distance ..... 1.5 m (4.92 ft) – infinity  
 Illuminated crosshair ..... Variable (10 steps)

## POWER SUPPLY

Internal battery ..... Rechargeable Li-Ion battery 11.1 V, 4.4 Ah  
 Operating time<sup>5</sup> ..... Approximately 6 hours on one internal battery

## WEIGHT

Instrument with internal battery ..... 5.25 kg (11.57 lb)

## ROBOTIC SPECIFICATIONS

Range<sup>3</sup> ..... 700 m (2,297 ft)  
 Shortest search distance ..... 0.2 m (0.65 ft)

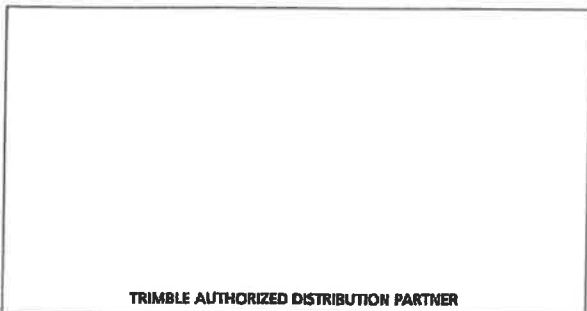
## ATS MODE FOR GRADE CONTROL

Range to target (MT900)<sup>1,2,3</sup> ..... 700 m (2,297 ft)  
 Search time (typical)<sup>4</sup> ..... 2-10 s  
 Search area ..... 360 degrees (400 gon)  
 or defined horizontal and vertical search window  
 Maximum velocity of target  
 Radial speed ..... 114°/s  
 Axial speed ..... 6 m/s  
 Data output  
 Rate ..... 20 Hz  
 Timing ..... ± 1 ms  
 Latency over radio ..... 40 ms  
 Synchronized measurement data ..... <1 ms  
 Number of Target ID channels ..... 16

Specifications subject to change without notice.

- 1 The accuracy statement is valid for a static target or a target moving at constant speed. During acceleration or deceleration, or a target moving with high speed >15 kph (9.3 mph) the accuracy will decrease.
- 2 Standard clear: No haze. Overcast or moderate sunlight with very light heat shimmer.
- 3 Range and accuracy depend on atmospheric conditions, size of prisms and background radiation.
- 4 Kodak Gray Card, number E1527795
- 5 The capacity at -20 °C (-5 °F) is 75% of the capacity at +20 °C (68 °F).
- 6 Dependent on selected size of search window.

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Project File Data	Coordinate System
Name: S:\Zoladz\Estimating\2018 Job Folder\18-004-C Phillips Road Reconstruction\Survey\Phillips Rd, Roch. 2018.vce	Name: SCS900 Localization
Size: 4 MB	Datum: WGS84 Equivalent Datum
Modified: 9/27/2019 9:40:19 AM (UTC:-4)	Zone: SCS900 Record
Time zone: Eastern Standard Time	Geoid:
Reference number:	Vertical datum:
Description:	Calibrated site:
Comment 1:	
Comment 2:	
Comment 3:	

## Site Calibration Report

### Horizontal Calibration Parameters

Translation north:	0.135 ft
Translation east:	3.431 ft
Rotation:	-0°47'49"
Origin northing:	1186775.795 ft
Origin easting:	1458266.969 ft
Scale factor:	1.0000409135

### Vertical Calibration Parameters

Vertical shift at origin:	122.380 ft
Slope north:	8.682 ppm
Slope east:	-265.655 ppm
Origin northing:	1187021.459 ft
Origin easting:	1458257.572 ft

### Residual Differences Between GPS and Known Coordinates

#### Summary

	Maximum residual	Root Mean Square residual	Point
Horizontal	0.036 ft	0.026 ft	GPS_cbp3
Vertical	0.037 ft	0.018 ft	GPS_bm7
Three-dimensional	0.037 ft	0.030 ft	GPS_cbp6

### Point Residuals

Residuals sign: Calculated-Control

GNSS Point		Calculated Point		Grid Point	
<b>Point</b>	GPS_cbp5	<b>Point</b>	GPS_cbp5	<b>Point</b>	cbp5
<b>Latitude</b>	N43°15'06.70478"	<b>Northing</b>	1187021.459 ft	<b>Northing</b>	1187021.468 ft
<b>Longitude</b>	W77°25'11.47201"	<b>Easting</b>	1458257.572 ft	<b>Easting</b>	1458257.557 ft
<b>Height</b>	207.906 ft	<b>Elevation</b>	330.286 ft	<b>Elevation</b>	330.291 ft
		<b>Horiz. residual</b>	0.018 ft	<b>Type</b>	Horz and Vert
		<b>Vert. residual</b>	-0.005 ft		
		<b>3D residual</b>	0.019 ft		
<b>Point</b>	GPS_cbp6	<b>Point</b>	GPS_cbp6	<b>Point</b>	cbp6
<b>Latitude</b>	N43°15'17.61489"	<b>Northing</b>	1188125.851 ft	<b>Northing</b>	1188125.847 ft
<b>Longitude</b>	W77°25'11.65054"	<b>Easting</b>	1458228.998 ft	<b>Easting</b>	1458229.026 ft
<b>Height</b>	199.144 ft	<b>Elevation</b>	321.541 ft	<b>Elevation</b>	321.518 ft
		<b>Horiz. residual</b>	0.029 ft	<b>Type</b>	Horz and Vert
		<b>Vert. residual</b>	0.024 ft		
		<b>3D residual</b>	0.037 ft		
<b>Point</b>	GPS_GCM1939	<b>Point</b>	GPS_GCM1939	<b>Point</b>	GCM1939
<b>Latitude</b>	N43°14'25.73279"	<b>Northing</b>	1182875.065 ft	<b>Northing</b>	1182875.194 ft
<b>Longitude</b>	W77°25'09.77730"	<b>Easting</b>	1458440.708 ft	<b>Easting</b>	1458440.678 ft
<b>Height</b>	231.589 ft	<b>Elevation</b>	353.884 ft	<b>Elevation</b>	354.030 ft
		<b>Horiz. residual</b>	?	<b>Type</b>	(Ignored)
		<b>Vert. residual</b>	?		
		<b>3D residual</b>	?		
<b>Point</b>	GPS_bm1	<b>Point</b>	GPS_bm1	<b>Point</b>	bm1
<b>Latitude</b>	N43°14'27.04455"	<b>Northing</b>	1183007.848 ft	<b>Northing</b>	1183008.292 ft
<b>Longitude</b>	W77°25'09.79993"	<b>Easting</b>	1458437.184 ft	<b>Easting</b>	1458438.535 ft
<b>Height</b>	231.814 ft	<b>Elevation</b>	354.112 ft	<b>Elevation</b>	354.040 ft
		<b>Horiz. residual</b>	?	<b>Type</b>	(Ignored)
		<b>Vert. residual</b>	?		
		<b>3D residual</b>	?		
<b>Point</b>	GPS_cbp2	<b>Point</b>	GPS_cbp2	<b>Point</b>	cbp2
<b>Latitude</b>	N43°14'25.39828"	<b>Northing</b>	1182840.223 ft	<b>Northing</b>	1182840.214 ft
<b>Longitude</b>	W77°25'10.72376"	<b>Easting</b>	1458371.124 ft	<b>Easting</b>	1458371.151 ft
<b>Height</b>	232.374 ft	<b>Elevation</b>	354.687 ft	<b>Elevation</b>	354.680 ft
		<b>Horiz. residual</b>	0.029 ft	<b>Type</b>	Horz and Vert
		<b>Vert. residual</b>	0.007 ft		
		<b>3D residual</b>	0.030 ft		
<b>Point</b>	GPS_cbp3	<b>Point</b>	GPS_cbp3	<b>Point</b>	cbp3
<b>Latitude</b>	N43°14'37.22662"	<b>Northing</b>	1184038.233 ft	<b>Northing</b>	1184038.240 ft



<b>Longitude</b>	W77°25'10.26696"	<b>Easting</b>	1458388.274 ft	<b>Easting</b>	1458388.238 ft
<b>Height</b>	223.546 ft	<b>Elevation</b>	345.866 ft	<b>Elevation</b>	345.869 ft
		<b>Horiz. residual</b>	0.036 ft	<b>Type</b>	Horz and Vert
		<b>Vert. residual</b>	-0.003 ft		
		<b>3D residual</b>	0.037 ft		
<b>Point</b>	GPS_cbp7	<b>Point</b>	GPS_cbp7	<b>Point</b>	cbp7
<b>Latitude</b>	N43°15'29.60490"	<b>Northing</b>	1189339.867 ft	<b>Northing</b>	1189339.848 ft
<b>Longitude</b>	W77°25'11.54731"	<b>Easting</b>	1458219.753 ft	<b>Easting</b>	1458219.670 ft
<b>Height</b>	183.151 ft	<b>Elevation</b>	305.561 ft	<b>Elevation</b>	305.573 ft
		<b>Horiz. residual</b>	?	<b>Type</b>	(Ignored)
		<b>Vert. residual</b>	?		
		<b>3D residual</b>	?		
<b>Point</b>	GPS_cbp9	<b>Point</b>	GPS_cbp9	<b>Point</b>	cbp9
<b>Latitude</b>	N43°15'54.44712"	<b>Northing</b>	1191853.886 ft	<b>Northing</b>	1191853.884 ft
<b>Longitude</b>	W77°25'12.61151"	<b>Easting</b>	1458106.033 ft	<b>Easting</b>	1458106.028 ft
<b>Height</b>	166.443 ft	<b>Elevation</b>	288.905 ft	<b>Elevation</b>	288.930 ft
		<b>Horiz. residual</b>	0.005 ft	<b>Type</b>	Horz and Vert
		<b>Vert. residual</b>	-0.025 ft		
		<b>3D residual</b>	0.026 ft		
<b>Point</b>	GPS_bm7	<b>Point</b>	GPS_bm7	<b>Point</b>	bm7
<b>Latitude</b>	N43°15'37.90409"	<b>Northing</b>	1190180.140 ft	<b>Northing</b>	1190179.887 ft
<b>Longitude</b>	W77°25'11.51490"	<b>Easting</b>	1458210.464 ft	<b>Easting</b>	1458210.319 ft
<b>Height</b>	186.387 ft	<b>Elevation</b>	308.807 ft	<b>Elevation</b>	308.770 ft
		<b>Horiz. residual</b>	?	<b>Type</b>	Vertical
		<b>Vert. residual</b>	0.037 ft		
		<b>3D residual</b>	?		
<b>Point</b>	GPS_bm6	<b>Point</b>	GPS_bm6	<b>Point</b>	bm6
<b>Latitude</b>	N43°15'25.75624"	<b>Northing</b>	1188950.541 ft	<b>Northing</b>	1188950.434 ft
<b>Longitude</b>	W77°25'11.23105"	<b>Easting</b>	1458248.575 ft	<b>Easting</b>	1458247.969 ft
<b>Height</b>	193.760 ft	<b>Elevation</b>	316.159 ft	<b>Elevation</b>	316.180 ft
		<b>Horiz. residual</b>	?	<b>Type</b>	Vertical
		<b>Vert. residual</b>	-0.021 ft		
		<b>3D residual</b>	?		
<b>Point</b>	GPS_bm5	<b>Point</b>	GPS_bm5	<b>Point</b>	bm5
<b>Latitude</b>	N43°15'14.15506"	<b>Northing</b>	1187776.314 ft	<b>Northing</b>	1187776.436 ft
<b>Longitude</b>	W77°25'10.92402"	<b>Easting</b>	1458287.633 ft	<b>Easting</b>	1458287.495 ft
<b>Height</b>	200.332 ft	<b>Elevation</b>	322.710 ft	<b>Elevation</b>	322.706 ft
		<b>Horiz. residual</b>	?	<b>Type</b>	Vertical
		<b>Vert. residual</b>	0.004 ft		
		<b>3D residual</b>	?		
<b>Point</b>	GPS_bm4	<b>Point</b>	GPS_bm4	<b>Point</b>	bm4
<b>Latitude</b>	N43°15'02.29002"	<b>Northing</b>	1186575.294 ft	<b>Northing</b>	1186575.238 ft

<b>Longitude</b>	W77°25'10.69474"	<b>Easting</b>	1458321.311 ft	<b>Easting</b>	1458321.196 ft
<b>Height</b>	209.591 ft	<b>Elevation</b>	331.950 ft	<b>Elevation</b>	331.946 ft
		<b>Horiz. residual</b>	?	<b>Type</b>	Vertical
		<b>Vert. residual</b>	0.004 ft		
		<b>3D residual</b>	?		
<b>Point</b>	GPS_bm3	<b>Point</b>	GPS_bm3	<b>Point</b>	bm3
<b>Latitude</b>	N43°14'50.62680"	<b>Northing</b>	1185394.801 ft	<b>Northing</b>	1185394.835 ft
<b>Longitude</b>	W77°25'10.37394"	<b>Easting</b>	1458361.481 ft	<b>Easting</b>	1458361.113 ft
<b>Height</b>	219.453 ft	<b>Elevation</b>	341.791 ft	<b>Elevation</b>	341.810 ft
		<b>Horiz. residual</b>	?	<b>Type</b>	Vertical
		<b>Vert. residual</b>	-0.019 ft		
		<b>3D residual</b>	?		
<b>Point</b>	GPS_bm2	<b>Point</b>	GPS_bm2	<b>Point</b>	bm2
<b>Latitude</b>	N43°14'39.18997"	<b>Northing</b>	1184237.201 ft	<b>Northing</b>	1184237.015 ft
<b>Longitude</b>	W77°25'10.08098"	<b>Easting</b>	1458399.273 ft	<b>Easting</b>	1458399.271 ft
<b>Height</b>	226.827 ft	<b>Elevation</b>	349.145 ft	<b>Elevation</b>	349.148 ft
		<b>Horiz. residual</b>	?	<b>Type</b>	Vertical
		<b>Vert. residual</b>	-0.003 ft		
		<b>3D residual</b>	?		

Date: 10/29/2019 9:40:22 AM	Project: S:\Zoladz\Estimating\2018 Job Folder\18-004-C Phillips Road Reconstruction\Survey\Phillips Rd, Roch. 2018.vce	Trimble Business Center
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- 1 Import Record
- 2 Reports
- 3 Outputs
- 4 About
- 5 Change Tolerances
- 6 Clear Workbook

## Company Name

Company address  
City, State ZIP Code  
Phone Number / Fax Number

English

Work Order Name: **uts control check cbp9**

First Access: 7/30/2019 9:10

Last Access: 11/15/2019 14:01

Client:

### Record Type Data

### Base Measurement Data (US Survey ft)

Record Type	Sub Type	Point Name	Line Name	Point Code	Measured N	Measured E	Measured Elev	HA / Lat	VA / Long	SD / WGSHT	Precision 95% H	Precision 95% V	Precision Type
Stakeout	check point	cbp9rev_sik		rbc	1191853.714	1458106.062	288.703	43°15'54.4667"	-77°25'12.6057"	180.393	0.016	0.031	RTK Fixed
Control Point	remeasure disturbed cap	cbp9rev		rbc	1191853.750	1458106.080	288.720	43°15'54.4670"	-77°25'12.6063"	180.408	0.012	0.021	RTK Fixed

Project file data		Coordinate System	
Name:	S:\Zoladz\Estimating\2018 Job Folder\18-004-C Phillips Road Reconstruction\Survey\Phillips Rd. uts traverse2.vce	Name:	Scale Only
Size:	72 KB	Datum:	
Modified:	12/13/2019 3:22:41 PM (UTC:-5)	Zone:	
Time zone:	Eastern Standard Time	Geoid:	
Reference number:		Vertical datum:	
Description:		Calibrated site:	
Comment 1:			
Comment 2:			
Comment 3:			

## Transform Survey Points Report

### Measured Points (From)

Point ID	Northing	Easting	Elevation	Code	Northing Residual	Easting Residual	Elevation Residual
8-1 avg	1183591.771 ft	1458367.209 ft	347.706 ft		-0.002 ft	-0.016 ft	-0.014 ft
8-2 avg	1184430.815 ft	1458341.039 ft	344.737 ft		-0.010 ft	-0.029 ft	-0.035 ft
8-3 avg	1185904.940 ft	1458291.124 ft	338.852 ft		-0.007 ft	0.013 ft	0.042 ft
8-4 avg	1187476.815 ft	1458282.659 ft	325.622 ft		0.025 ft	0.024 ft	0.028 ft
8-5 avg	1189002.544 ft	1458234.367 ft	313.628 ft		0.011 ft	0.056 ft	0.005 ft
8-6 avg	1190466.355 ft	1458152.208 ft	305.506 ft		-0.005 ft	0.002 ft	-0.013 ft
8-7 avg	1191909.979 ft	1458157.676 ft	289.720 ft		-0.012 ft	-0.050 ft	-0.014 ft

### Control Points (To)

Point ID	Northing	Easting	Elevation	Code
8-1	1183591.771 ft	1458367.240 ft	347.711 ft	psm 7-10-19
8-2	1184430.821 ft	1458341.078 ft	344.772 ft	psm
8-3	1185904.938 ft	1458291.112 ft	338.826 ft	psm
8-4	1187476.777 ft	1458282.627 ft	325.630 ft	psm
8-5	1189002.516 ft	1458234.294 ft	313.676 ft	psm
8-6	1190466.338 ft	1458152.180 ft	305.585 ft	psm
8-7	1191909.966 ft	1458157.692 ft	289.820 ft	psm

### Least Squares Transformation

<b>Translation</b>		<b>Scale</b>	
<b>Northing:</b>	-0.013 ft	<b>Horizontal:</b>	0.9999972897
<b>Easting:</b>	-0.008 ft	<b>Vertical:</b>	0.9999972897
<b>Elevation:</b>	0.036 ft	<b>Scale/Rotation Origin</b>	
<b>Rotation</b>		<b>Northing:</b>	1187540.460 ft
<b>X axis:</b>	-0°00'03"	<b>Easting:</b>	1458260.897 ft
<b>Y axis:</b>	0°00'14"	<b>Elevation:</b>	323.682 ft
<b>Z axis:</b>	359°59'59"	<b>Transformation time:</b>	12/13/2019 3:36:41 PM

Note: Final Point = Rotation \* (Scale \* (Initial Point - Origin)) + Origin + Translation. Rotations are clockwise positive and are applied in the order YXZ.

### Transformation Statistics

<b>Overall Residual</b>		<b>Easting Residual</b>	
<b>Standard deviation:</b>	0.043 ft	<b>Standard deviation:</b>	0.033 ft
<b>Maximum (8-5 avg):</b>	0.057 ft	<b>Maximum (8-5 avg):</b>	0.056 ft
<b>Mean:</b>	0.000 ft	<b>Mean:</b>	0.000 ft
<b>Northing Residual</b>		<b>Elevation Residual</b>	
<b>Standard deviation:</b>	0.012 ft	<b>Standard deviation:</b>	0.025 ft
<b>Maximum (8-4 avg):</b>	0.025 ft	<b>Maximum (8-3 avg):</b>	0.042 ft
<b>Mean:</b>	0.000 ft	<b>Mean:</b>	0.000 ft

### Transformed Points - 1

Point ID	Northing	Easting	Elevation	Code
8-5	1189002.499 ft	1458234.277 ft	313.729 ft	psm

12/13/2019 3:36:48 PM	S:\Zoladz\Estimating\2018 Job Folder\18-004-C Phillips Road Reconstruction\Survey\Phillips Rd. uts traverse2.vce	Trimble Business Center
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**Table of GPS field measurement at PSM locations  
Phillips Rd Project 1709  
Prepared 12-2019**

**Table 1**

Direct-Reverse 7-2019*				Direct-Reverse 11-2019*					
Point Name	Measured N	Measured E	Elv	Point Code	Point Name	Measured N	Measured E	Elv	Point Code
psm8-1a	1183591.768	1458367.241	347.715	gps mon	psm8-1a	1183591.733	1458367.151	347.735	gps mon
psm8-1b	1183591.802	1458367.256	347.684	gps mon	psm8-1b	1183591.778	1458367.184	347.687	gps mon
8-1 avg	1183591.785	1458367.249	347.700		8-1 avg	1183591.756	1458367.168	347.711	
psm8-2a	1184430.829	1458341.065	344.719	gps mon	psm8-2a	1184430.779	1458340.975	344.741	gps mon
psm8-2b	1184430.838	1458341.090	344.733	gps mon	psm8-2b	1184430.812	1458341.023	344.754	gps mon
8-2 avg	1184430.834	1458341.078	344.726		8-2 avg	1184430.796	1458340.999	344.748	
psm8-3a	1185904.936	1458291.123	338.891	gps mon	psm8-3a	1185904.984	1458291.135	338.782	gps mon
psm8-3b	1185904.947	1458291.143	338.835	gps mon	psm8-3b	1185904.889	1458291.094	338.900	gps mon
8-3 avg	1185904.942	1458291.133	338.863		8-3 avg	1185904.937	1458291.115	338.841	
psm8-4a	1187476.808	1458282.713	325.617	gps mon	psm8-4a	1187476.921	1458282.698	325.594	gps mon
psm8-4b	1187476.840	1458282.668	325.650	gps mon	psm8-4b	1187476.691	1458282.556	325.625	gps mon
8-4 avg	1187476.824	1458282.691	325.634		8-4 avg	1187476.806	1458282.627	325.610	
psm8-5a	1189002.536	1458234.392	313.608	gps mon	psm8-5a	1189002.571	1458234.350	313.655	gps mon
psm8-5b	1189002.537	1458234.348	313.566	gps mon	psm8-5b	1189002.638	1458234.376	313.668	gps mon
8-5 avg	1189002.537	1458234.370	313.587		8-5 avg	1189002.550	1458234.363	313.668	
psm8-6a	1190466.358	1458152.274	305.481	gps mon	psm8-6a	1190466.403	1458152.202	305.423	gps mon
psm8-6b	1190466.346	1458152.228	305.500	gps mon	psm8-6b	1190466.313	1458152.125	305.374	gps mon
8-6 avg	1190466.352	1458152.251	305.491		8-6 avg	1190466.358	1458152.164	305.398	
psm8-7a	1191909.985	1458157.742	289.673	gps mon	psm8-7a	1191910.010	1458157.561	289.680	gps mon
psm8-7b	1191910.001	1458157.773	289.645	gps mon	psm8-7b	1191909.920	1458157.625	289.880	gps mon
8-7 avg	1191909.993	1458157.758	289.659		8-7 avg	1191909.965	1458157.593	289.780	

\* measurements noted "a", "b" are 1.5 minute duration GPS/RTK observation. Rod placement reoriented 180° between observation

Table 2  
 Phillips Rd Project #1709  
 Prepared Dec. 2019

Pt	Total Station adjusted			GPS avg 07-19*			GPS avg 11-19*			AVG (07-19)&(11-19)*			
	N	E	Elev	N	E	Elev	N	E	Elev	Pt	N	E	Elev
cbp2	1182840.214	1458371.151	354.680								1182840.214	1458371.151	354.680
8-1 avg	1183591.771	1458367.240	347.711	1183591.785	1458367.249	347.700	1183591.756	1458367.168	347.711	cbp2	1183591.771	1458367.209	347.706
8-2 avg	1184430.821	1458341.078	344.772	1184430.834	1458341.078	344.726	1184430.796	1458340.999	344.748	8-1 avg	1184430.815	1458341.039	344.737
8-3 avg	1185904.938	1458291.112	338.876	1185904.942	1458291.133	338.863	1185904.937	1458291.115	338.841	8-2 avg	1185904.940	1458291.124	338.852
8-4 avg	1187476.777	1458282.627	325.630	1187476.824	1458282.691	325.634	1187476.806	1458282.627	325.610	8-3 avg	1187476.815	1458282.659	325.622
8-5 avg	1189002.516	1458234.294	313.676	1189002.537	1458234.370	313.587	1189002.550	1458234.363	313.668	8-4 avg	1189002.544	1458234.367	313.628
8-6 avg	1190466.338	1458152.180	305.585	1190466.352	1458152.251	305.491	1190466.358	1458152.164	305.520	8-5 avg	1190466.355	1458152.208	305.506
tp1	1191009.687	1458140.609	301.757							tp1			
8-7 avg	1191909.966	1458157.692	289.820	1191909.993	1458157.758	289.659	1191909.965	1458157.593	289.780	8-6 avg	1191909.979	1458157.676	289.720
cbp10	1192013.246	1457008.151	293.016							cbp10			293.016

\* Refer to "Table of GPS field measurement" (attached) for field data.