

CONTROL REPORT

D214386

New York State Thruway Authority

Design Phase I-IV, Replacement of 8 Syracuse Division Bridges

North Main Street Bridge over Mainline (BIN 5512790)

Mile Post 262.01 in the Syracuse Division

Madison County



February 2017


Prepared for:

New York State Thruway Authority
Syracuse Division

Prepared by:

Foit-Albert Associates
Architecture, Engineering and Surveying, PC
763 Main Street
Buffalo, New York 14203

I, Michael J. Pohl, PLS hereby certify that this survey was performed to the standards set forth in the "State of New York Department of Transportation Surveying and Procedure Manual".


Michael J. Pohl, PLS
NYS License No. 049978



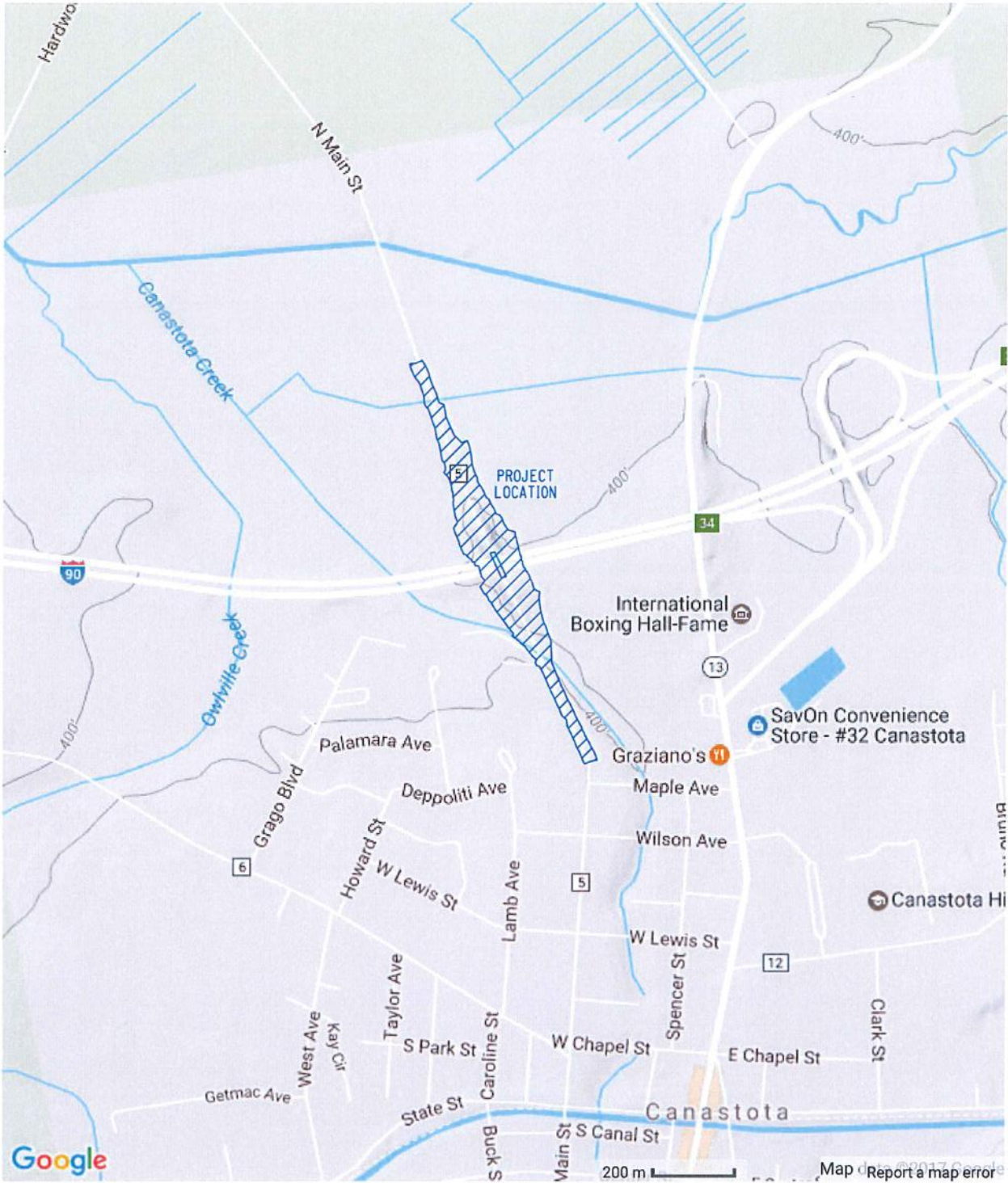
D214386
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Design Phase I-IV, Replacement of 8 Syracuse Division Bridges
North Main Street Bridge over Mainline (BIN 5512790)
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INTRODUCTION

SITE LOCATION MAP



 [Print this map](#)

Map provided by TopoZone.com

PROJECT NARRATIVE

D214386
New York State Thruway Authority
Design Phase I-IV, Replacement of 8 Syracuse Division Bridges
North Main Street Bridge over Mainline (BIN 5512790)
Mile Post 262.01 in the Syracuse Division
Madison County

PROJECT NARRATIVE

This project involves providing preliminary design services to address corridor needs along and underneath Interstate 90, at MP 262.01 North Main Street Bridge over Mainline, within the Syracuse Division.

Foit-Albert Associates has been retained by Stantec Consulting Services Inc. to establish primary and secondary horizontal and vertical project control and provide topographic survey and mapping.

The field work was performed from October 26, 2016 to December 30, 2016. The weather conditions during the project were varied with temperatures ranging from highs in the 50's to lows in the 20's. Conditions also varied from snow and sleet to rain and sunshine.

Field Crew Members:

Crew Chief – Jeremy Smith
Instrument Operators – Michael Matesic, Jay Maurer, Joshua Clarkson


Field Equipment:

Leica DNA2003 Digital Level
Trimble S6, 2" Digital Robotic Total Station with TSC-3 Data Collector with
Trimble Access Data Collection
Trimble R8 Model 3 GNSS GPS Rover and Base Receiver
Trimble R8 Model 3 GNSS GPS Rover
Trimble TSC-3 Data Collectors with Trimble Access Data Collection

Software:

Survey data was processed using Carlson software version 2016 with AutoCAD version 2014.
The DTM, and field book files were processed and created using Bentley Microstation with InRoads version 08.11.09.655 software.
The Base Map, Contour Map, Text Map and Points Map were created using Microstation V8i.

I, Michael J. Pohl, PLS hereby certify that this survey was performed to the standards set forth in the "State of New York Department of Transportation Surveying and Procedure Manual".



Michael J. Pohl, PLS
NYS License No. 049978



HORIZONTAL CONTROL

D214386
New York State Thruway Authority
Design Phase I-IV, Replacement of 8 Syracuse Division Bridges
North Main Street Bridge over Mainline (BIN 5512790)
Mile Post 262.01 in the Syracuse Division
Madison County

HORIZONTAL CONTROL NARRATIVE

The Primary horizontal control for the site was established by utilizing 3 GPS control pairs set along the NYS Thruway corridor by Foit-Albert Associates.

Primary GPS Control pairs CBP 1 – CBP 2, CBP 4 – CBP 5 and CBP 7 – CBP 8 were established using utilizing static GPS methods. The GPS static files were post-processed using OPUS user solutions. The three sets of Primary GPS control pairs were swing-tied and sketched.

Two secondary horizontal traverses were also run to obtain topographic information along, underneath and in the surrounding project along the New York State Thruway (I-90). The first traverse was a closed leg traverse that began by occupying the Primary GPS pair CBP 1 – CBP 2. The traverse then proceeded in a northerly direction continuing through CBP 3 and closing on the Primary GPS pair CBP 4 – CBP 5. Spur points CBS 2A and CBS 3A were also set at the site to obtain topographic information. Using the formula $4.5 \times \text{the square root of } N$ where 4.5 is seconds of arc and N is the number of traverse segments, the first traverse had an allowable angular misclosure of 6.36" and had an actual angular misclosure of 5.67".

The second traverse was also a closed leg traverse that began by occupying the Primary GPS pair CBP 1 – CBP 2, the traverse then proceeded in a southerly direction continuing through CBP 6 and then closing on the Primary GPS pair CBP 7 – CBP 8. Using the formula $4.5 \times \text{the square root of } N$ where 4.5 is seconds of arc and N is the number of traverse segments, the first traverse had an allowable angular misclosure of 6.36" and had an actual angular misclosure of 5.92".

The horizontal control traverse was run in accordance with the New York State Department of Transportation Surveying and Procedures Manual using a Trimble S6 electronic total station, serial number 93010506, having a direct reading of 2" and a least count accuracy of 0.1".

Prior to measuring angles and distances at each station, the field crew measured and recorded the temperature and atmospheric pressure and set the correction in the instrument. The vertical and horizontal index error was checked and set as necessary. The correction for curvature was not set due to the small scale of the project site.

Two sets of direct and two sets of inverted angles were measured at each station. All angles were measured right and were rejected if the sum of a single set deviated from 360 degrees by more than 5 seconds.

Vertical angles and slope distances were measured from both ends of each control line. The slope distances were measured in U.S. Survey Feet at all pointings and reduced to horizontal distances. The slope distances were rejected if the forward and backward measurements differed by more than the EDM precision of +/- (2mm + 2ppm).

Control Recovered:

N/A

Control Not Recovered:

N/A

Horizontal Datum:

New York State Plane Coordinate System, Central Zone, NAD 83
Established by Relative and Static GPS techniques.

Combined Grid Scale Factor:

A combined scale factor of 0.99997981 was used.

Existing Control:

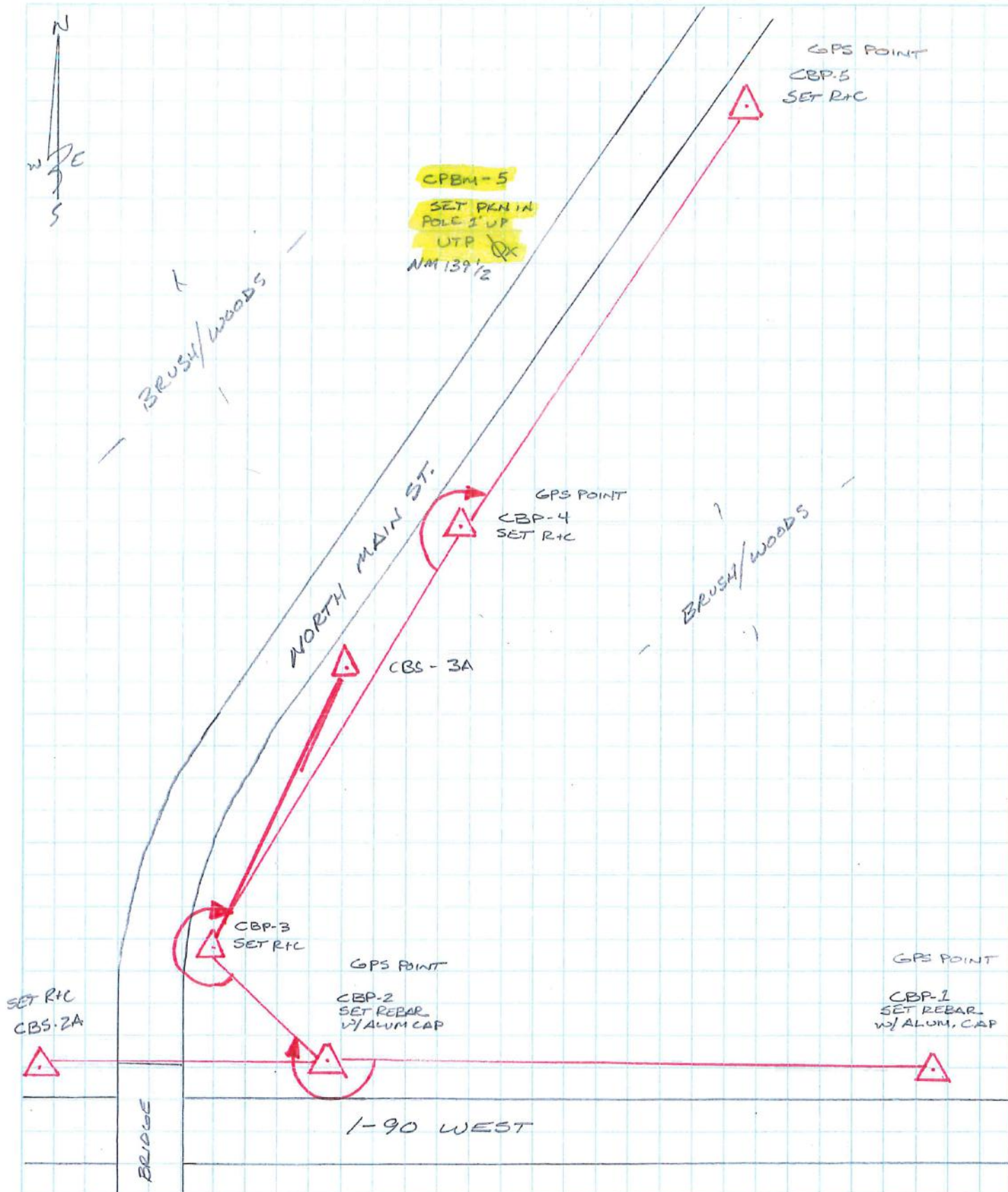
N/A

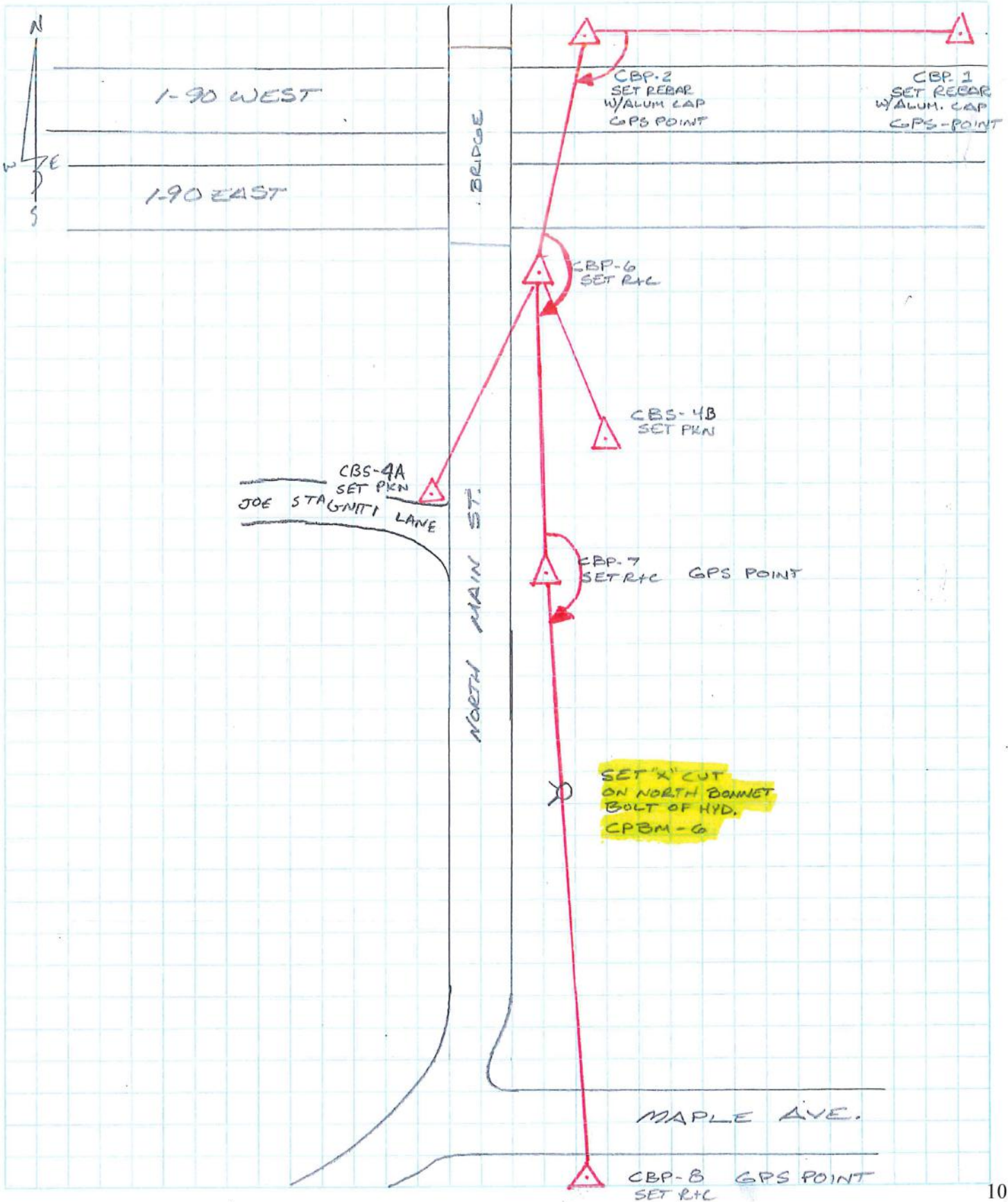
Traverse Closure and Adjustment:

The two closed leg traverses that were run for this project were adjusted by first balancing the angles to the GPS azimuth pairs, then by performing a Compass Rule Adjustment. Both traverses met the minimum traverse closure requirements in accordance with the New York State Department Of Transportation Land Surveying Standards and Procedures Manual.

	<u>Raw Closure</u>	<u>Closure After Angle Balance</u>
Traverse 1	1 in 25666	1 in 32852
Traverse 2	1 in 17476	1 in 22738

TRAVERSE SKETCH





LIST OF BASELINE COORDINATES

Survey Fieldbook Coordinate List Report

Report Created: 2/21/2017

Time: 8:28am

Fieldbook: 1600130 Site 4

Slope Distance Scale Factor: 1.000000000000

Note: All units in this report are in feet unless specified otherwise.

Number	Northing	Easting	Elevation	Code	Description	STA
1GPS	1127557.5300	1042169.2116	400.824	CBP	REBAR ALUM CAP	ML STA 21+66.80
2GPS	1127271.8137	1041037.9310	403.829	CBP	REBAR ALUM CAP	ML STA 10+00.00 NM STA 28+75.42
2A	1127231.2307	1040864.4245	404.671	CBS	REBAR AND CAP	
3	1127305.1816	1040918.5443	418.649	CBP	REBAR AND CAP	NM STA 29+99.38
3A	1127683.5344	1040745.3767	404.194	CBS	REBAR AND CAP	
4GPS	1128194.7285	1040545.3270	395.854	CBP	REBAR AND CAP	NM STA 39+64.05
4A	1126561.1102	1041175.3589	401.917	CBS	MAG NAIL	
4B	1126507.6726	1041305.2350	403.405	CBS	MAG NAIL	
5GPS	1129132.9058	1040202.2241	395.301	CBP	REBAR AND CAP	NM STA 49+63.00
6	1127063.7818	1041030.8800	419.237	CBP	REBAR AND CAP	NM STA 26+67.27
7GPS	1126459.6292	1041324.3344	403.126	CBP	REBAR AND CAP	NM STA 19+95.62
8GPS	1125550.1570	1041729.4487	410.918	CBP	REBAR ALUM CAP	NM STA 10+00.00

CONTROL POINT TIE SHEETS

FOIT-ALBERT ASSOCIATES CONTROL SURVEY DATA

PROJECT - ASSIGNMENT No. 9

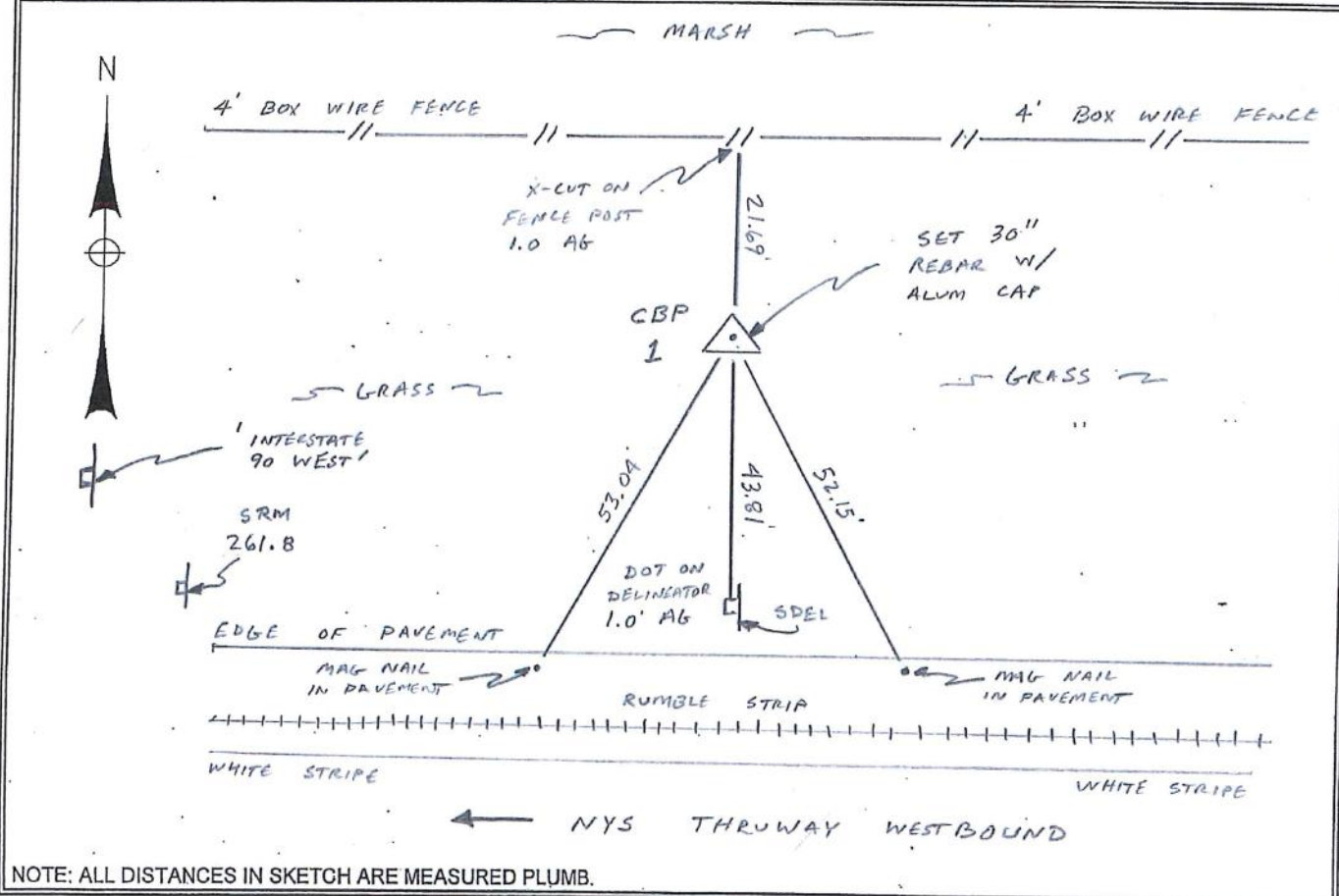
P.I.N. D214386 SITE 4

PROJECTION NAD 83
NY CENTRAL ZONE, 3102

ORDER OF SURVEY: _____
STATE PLANE COORDINATE SYSTEM

CITY OR TOWN, COUNTY	NAME OF STATION	YEAR
CANASTOTA, MADISON	CP No. 1	2016
N(Y) = <u>1127557.5300</u> (GRID)	DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS OBSERVED AT STATION	
E(X) = <u>1042169.2116</u> (GRID)	OBJECT	GRID DISTANCE (METER)
VERTICAL DATUM: <u>NAVD 88</u>		GRID BEARING
ELEVATION (METER): <u>400.824</u>		
COMBINED FACTOR <u>0.99997981</u>		
ESTABLISHED BY: <u>SS</u> YEAR <u>2016</u>		
FOIT-ALBERT ASSOCIATES		

DESCRIPTION: SET 30" REBAR WITH ALUMINUM CAP ON THE NORTH SIDE OF NYS THRUWAY WESTBOUND SHOULDER, 50'± NORTH OF THE EDGE OF PAVEMENT AND 1250'± EAST OF THE EAST BRIDGE FACE OF NORTH MAIN STREET.



NOTE: ALL DISTANCES IN SKETCH ARE MEASURED PLUMB.

CHECKED BY: _____ DATE: _____

FOIT-ALBERT ASSOCIATES CONTROL SURVEY DATA

PROJECT - ASSIGNMENT No. 9

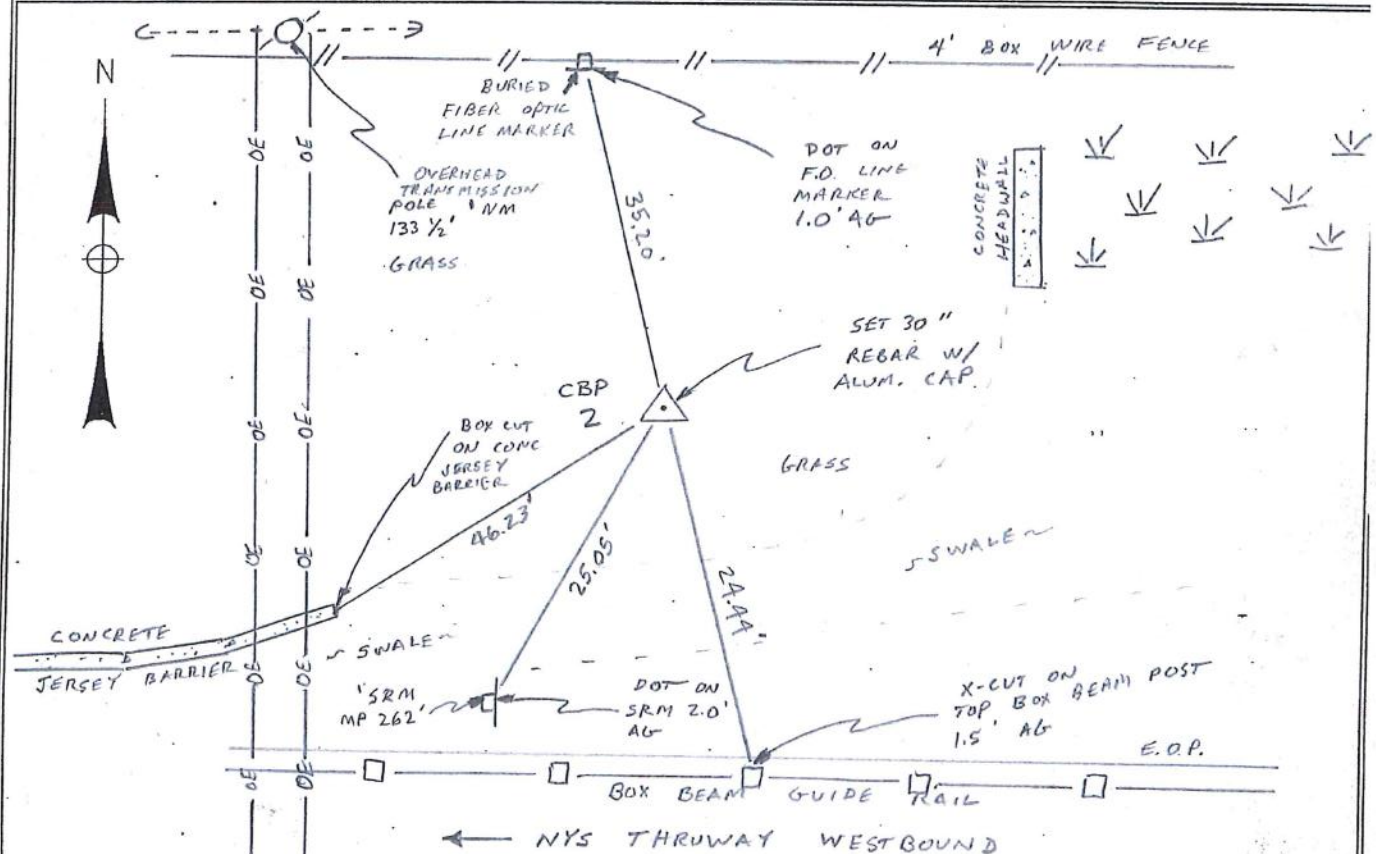
P.I.N. D214386 SITE 4

PROJECTION NAD 83
NY CENTRAL ZONE, 3102

ORDER OF SURVEY: _____
STATE PLANE COORDINATE SYSTEM

CITY OR TOWN, COUNTY	NAME OF STATION	YEAR
CANASTOTA, MADISON	CP No. 2	2016
N(Y) = 1127271.8137 (GRID)	DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS OBSERVED AT STATION	
E(X) = 1041037.9310 (GRID)	OBJECT	GRID DISTANCE (METER)
VERTICAL DATUM: NAVD 88		GRID BEARING
ELEVATION (METER): 403.829		
COMBINED FACTOR 0.99997981		
ESTABLISHED BY: JS YEAR 2016		
FOIT-ALBERT ASSOCIATES		

DESCRIPTION: SET 30" REBAR WITH ALUMINUM CAP ON THE NORTH SIDE OF NYS THRUWAY WESTBOUND, 93'± EAST OF THE EAST FACE OF NORTH MAIN STREET BRIDGE, 21'± NORTH OF EDGE OF PAVEMENT.



NOTE: ALL DISTANCES IN SKETCH ARE MEASURED PLUMB.

CHECKED BY: _____ DATE: _____

FOIT-ALBERT ASSOCIATES CONTROL SURVEY DATA

PROJECT - ASSIGNMENT #9

P.I.N. D214386 SITE 4

PROJECTION NAD 83

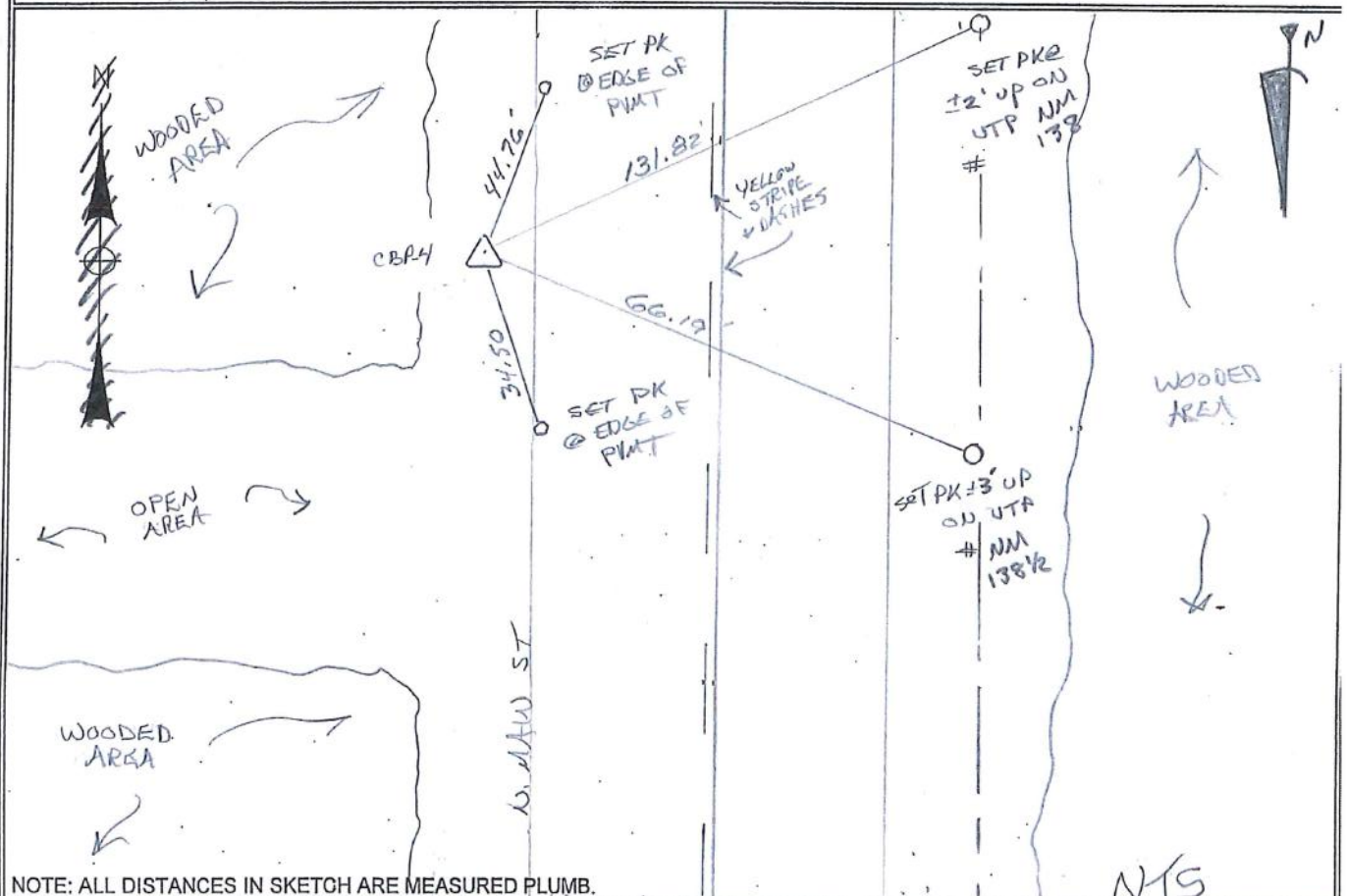
ORDER OF SURVEY: _____

NY CENTRAL ZONE, 3102

STATE PLANE COORDINATE SYSTEM

CITY OR TOWN, COUNTY	NAME OF STATION	YEAR
CAVASTOTA, MADISON	CP No. 4	2016
N(Y) = 1128194.7285 (GRID)	DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS OBSERVED AT STATION	
E(X) = 1040545.3270 (GRID)	OBJECT	GRID DISTANCE (METER)
VERTICAL DATUM: <u>NAD 83</u>		GRID BEARING
ELEVATION (METER): <u>395.854</u>		
COMBINED FACTOR <u>0.99997981</u>		
ESTABLISHED BY: <u>JDM</u> YEAR <u>2016</u>		
FOIT-ALBERT ASSOCIATES		

DESCRIPTION: SET $\frac{1}{2}$ " \times RBC $\pm 1,000'$ N. OF BRIDGE ON MAIN ST @ EAST SIDE OF MAIN ST $\pm 5'$ FROM EDGE OF PUNT.



CHECKED BY: _____

DATE: _____

FOIT-ALBERT ASSOCIATES CONTROL SURVEY DATA

PROJECT - ASSIGNMENT #9

P.I.N. D 214 386 SITE 4

PROJECTION NAD83

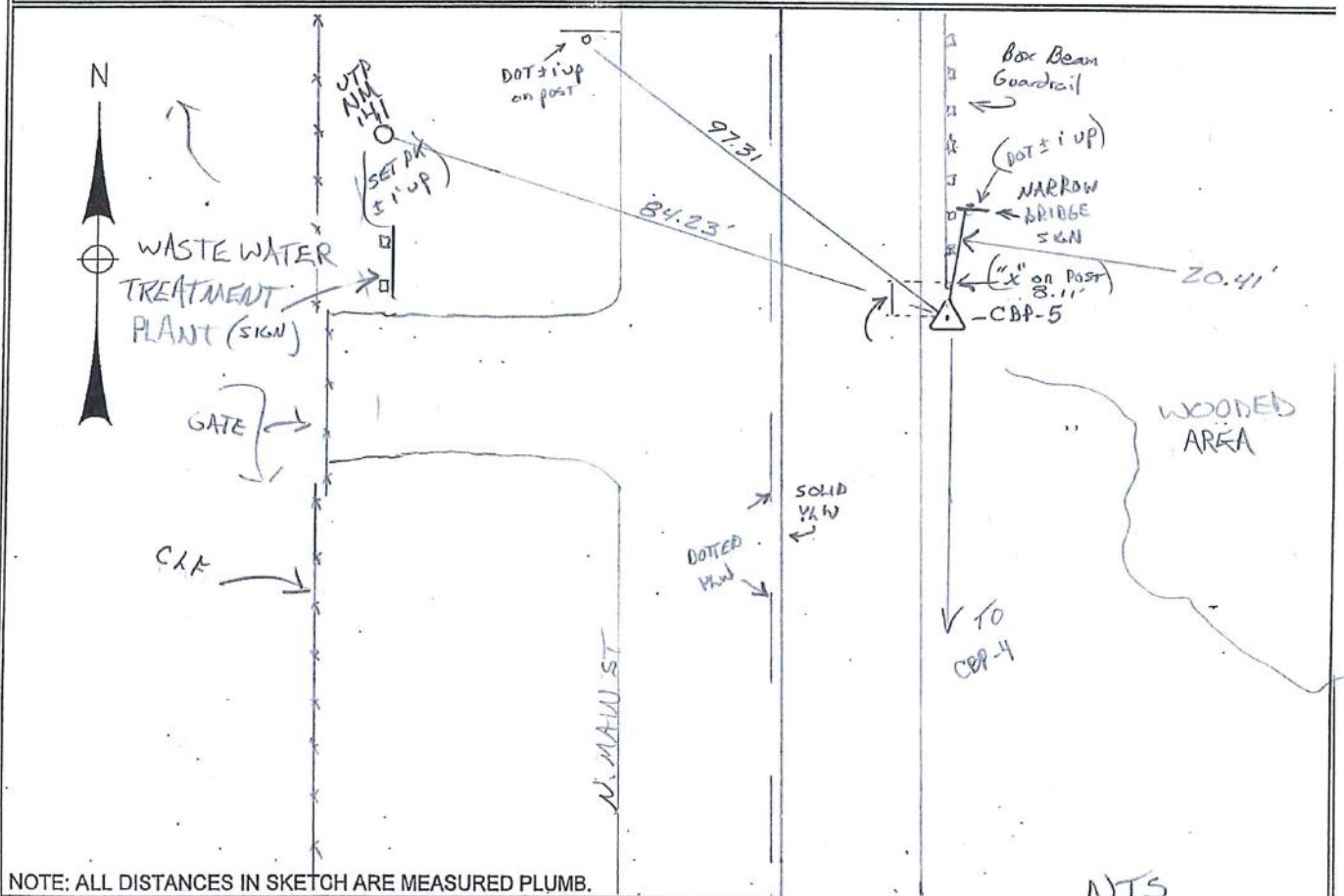
ORDER OF SURVEY: _____

NY CENTRAL ZONE, 3182

STATE PLANE COORDINATE SYSTEM

CITY OR TOWN, COUNTY	NAME OF STATION	YEAR
CANASTOTA, MADISON	CP No. 5	2016
N(Y) = 1129132.9058 (GRID)	DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS OBSERVED AT STATION	
E(X) = 1040202.2241 (GRID)	OBJECT	GRID DISTANCE (METER)
VERTICAL DATUM: <u>NAVD 88</u>		GRID BEARING
ELEVATION (METER): 395.301		
COMBINED FACTOR		
ESTABLISHED BY: <u>JLM</u> YEAR 2016		
FOIT-ALBERT ASSOCIATES		

DESCRIPTION: SET 1/2" Ø RBC @ ± 2,000' N. of Bridge @ South end of box beam guardrail on East side of Main St. Across from Albert Deppoliti Waste Water Treatment plant.



NOTE: ALL DISTANCES IN SKETCH ARE MEASURED PLUMB.

CHECKED BY: _____

DATE: _____

FOIT-ALBERT ASSOCIATES CONTROL SURVEY DATA

PROJECT - ASSIGNMENT No. 9

P.I.N. D214380 SITE 4

PROJECTION NAD 83

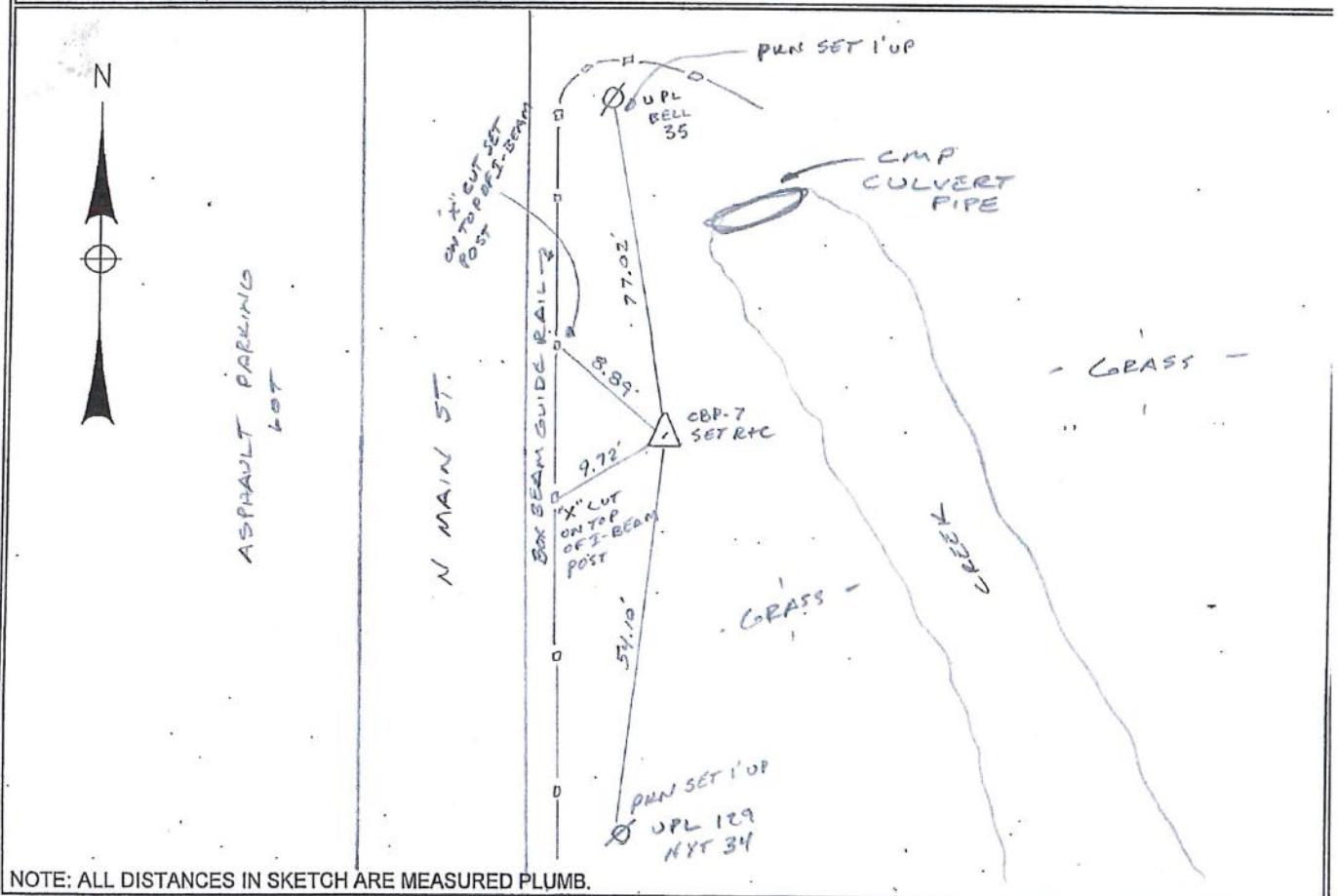
ORDER OF SURVEY: _____

NY CENTRAL ZONE, 3102

STATE PLANE COORDINATE SYSTEM

CITY OR TOWN, COUNTY	NAME OF STATION	YEAR
CANASTOTA, MADISON	CP No. 7	2017
N(Y) = <u>1126459.6292</u> (GRID)	DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS OBSERVED AT STATION	
E(X) = <u>1041324.3344</u> (GRID)	OBJECT	GRID DISTANCE (METER)
VERTICAL DATUM: <u>NAVD 88</u>		GRID BEARING
ELEVATION (METER): <u>403.125</u>		
COMBINED FACTOR <u>0.99997981</u>		
ESTABLISHED BY: <u>MM</u> YEAR <u>2017</u>		
FOIT-ALBERT ASSOCIATES		

DESCRIPTION: SET R+L 1'000' + OR - SOUTH OF I-90 BRIDGE ON EAST SIDE OF N. MAIN ST. IN GRASS AREA, 7'± WEST OF THE EAST EDGE OF PAVEMENT.



CHECKED BY: _____ DATE: _____

FOIT-ALBERT ASSOCIATES CONTROL SURVEY DATA

PROJECT - ASSIGNMENT No. 9

P.I.N. DZ14386 SITE 4

PROJECTION NAD 83

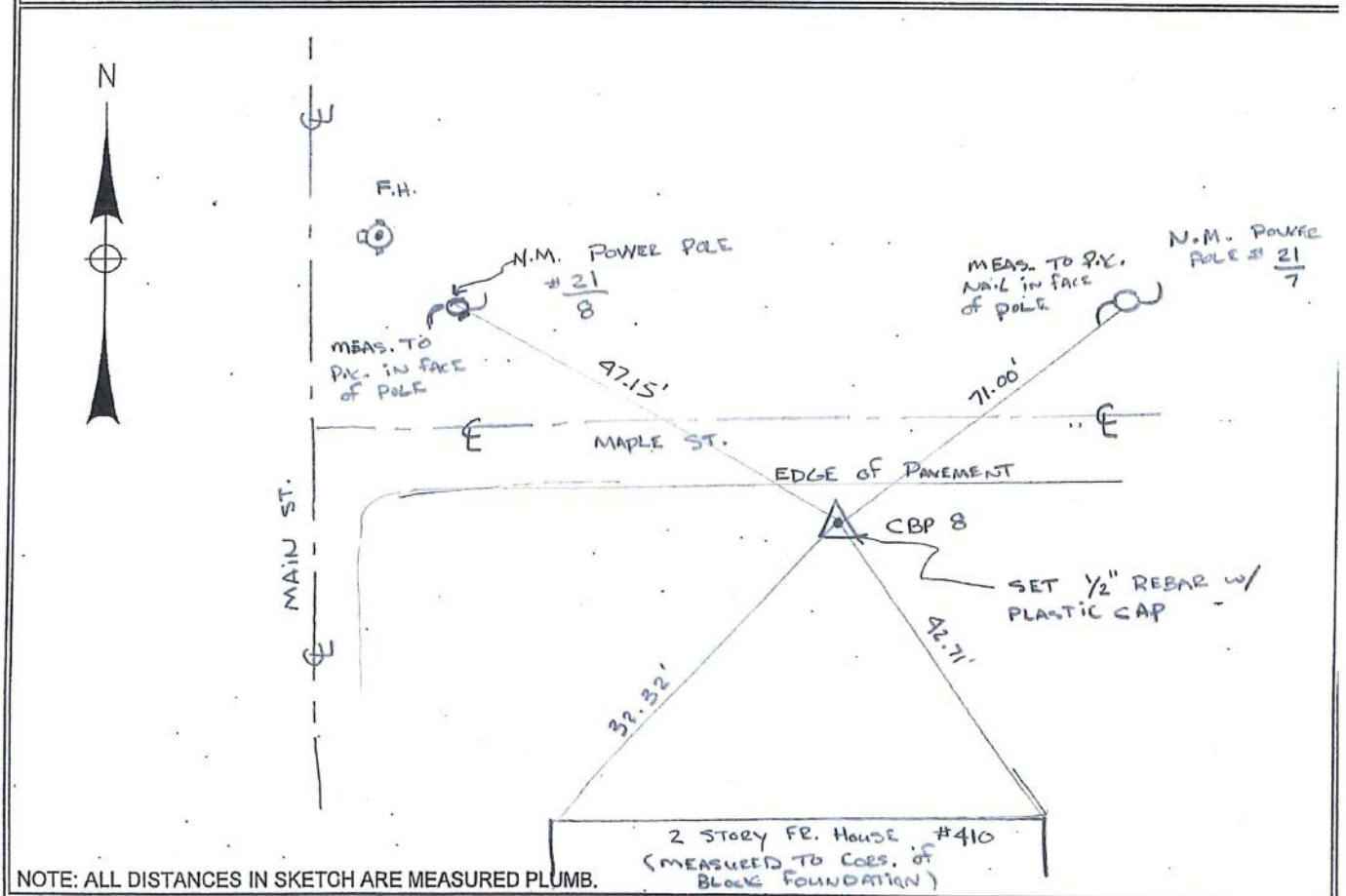
ORDER OF SURVEY: _____

NY CENTRAL ZONE, 3102

STATE PLANE COORDINATE SYSTEM

CITY OR TOWN, COUNTY	NAME OF STATION	YEAR
CANASTOTA, MADISON	CP No. 8	2017
N(Y) = 1125550.1570 (GRID)	DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS OBSERVED AT STATION	
E(X) = 1041729.4487 (GRID)	OBJECT	GRID DISTANCE (METER)
VERTICAL DATUM: NAVD 88		GRID BEARING
ELEVATION (METER): 410.917		
COMBINED FACTOR 0.99997981		
ESTABLISHED BY: M.M. YEAR 2017		
FOIT-ALBERT ASSOCIATES		

DESCRIPTION: SET R+L 2000' +/- SOUTH OF I-90 BRIDGE EAST SIDE OF NORTH MAIN ST. SOUTH SIDE OF MAPLE ST. 50' +/- FROM CORNER, 5' ± SOUTH OF THE SOUTH EDGE OF PAVEMENT.



CHECKED BY: _____

DATE: _____

TRAVERSE COMPUTATIONS

TRAVERSE 1

Process No Adjust Results

Tue Jan 17 20:48:45 2017

Raw File: I:\2016\16001.00 Engineering Survey\16001.30 NYSTA - Four Bridges\Drawings\Surv\Field Files\Site 4\1600130SITE47SG_(Trav 1)_edited.rw5

Coordinate File: I:\2016\16001.00 Engineering Survey\16001.30 NYSTA - Four Bridges\Drawings\Surv\CRD - Point Database\16001.30 Site 4 COMPS.crd

Scale Factor: 0.99997981

Correct for Earth Curvature: OFF

Closure Results

Starting Point 2GPS: N 1127271.8137 E 1041037.9310 Z 403.8244

Closing Reference Point 4GPS: N 1128194.7285 E 1040545.3270 Z 395.8539

Ending Point 4: N 1128194.7121 E 1040545.3661 Z 395.7769

Azimuth Of Error: 112°42'23"

North Error : -0.01637

East Error : 0.03913

Vertical Error : -0.07701

Hx Dist Error : 0.04241

Sl Dist Error : 0.08792

Traverse Lines : 2

SideShots : 3

Store Points : 4

Horiz Dist Traversed: 1088.5988

Slope Dist Traversed: 1089.6887

Closure Precision: 1 in 25665.9

Starting Point 2GPS: N 1127271.8137 E 1041037.9310 Z 403.8244

Backsight Point 1GPS: N 1127557.5300 E 1042169.2116 Z 400.8244

Point No. Description	Horizontal Angle	Zenith Angle	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
3 CBP ,R&C	AR209.4722	83.2444	124.7850	5.300	4.800	1127305.179	1040918.548	418.6397
4 CBP ,R&C	AR231.3732	91.2044	964.9270	5.225	5.430	1128194.712	1040545.366	395.7769

Process Angle Balance Results

Tue Jan 17 20:50:35 2017

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4\1600130SITE475G_(Trav 1)_edited.rw5

Coordinate File: I:\2016\16001.00 Engineering Survey\16001.30 NYSTA - Four Bridges\Drawings\Surv\CRD -
Point Database\16001.30 Site 4 COMPS.crd

Scale Factor: 0.99997981

Correct for Earth Curvature: OFF

Closure Results (Before Angle Balance)

Starting Point 2GPS: N 1127271.8137 E 1041037.9310 Z 403.8244

Closing Reference Point 4GPS: N 1128194.7285 E 1040545.3270 Z 395.8539

Ending Point 4: N 1128194.7121 E 1040545.3661 Z 395.7769

Azimuth Of Error: 112°42'23"

North Error : -0.01637

East Error : 0.03913

Vertical Error : -0.07701

Hz Dist Error : 0.04241

Sl Dist Error : 0.08792

Traverse Lines : 2

SideShots : 3

Store Points : 4

Horiz Dist Traversed: 1088.5988

Slope Dist Traversed: 1089.6887

Closure Precision: 1 in 25665.9

Starting Point 2GPS: N 1127271.8137 E 1041037.9310 Z 403.8244

Backsight Point 1GPS: N 1127557.5300 E 1042169.2116 Z 400.8244

Point No.	Horizontal Angle	Zenith Angle	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
3	AR209.4722	83.2444	124.7850	5.300	4.800	1127305.179	1040918.548	418.6397
CBP ,R&C								
4	AR231.3732	91.2044	964.9270	5.225	5.430	1128194.712	1040545.366	395.7769
CBP ,R&C								

Angle Balance

Angular Error: 0°00'05.67" for 3 traverse sides

Adjusting Each Angle: 0°00'01.89"

Closure Results (After Angle Balance)

Starting Coordinates : N 1127271.8137 E 1041037.9310 Z 403.8244

Closing Reference Point 4GPS: N 1128194.7285 E 1040545.3270 Z 395.8539

Ending Coordinates : N 1128194.7042 E 1040545.3495 Z 395.7769

Azimuth Of Error: 137°10'20"

North Error : -0.02430

East Error : 0.02253

Vertical Error : -0.07701

Hz Dist Error : 0.03314

Sl Dist Error : 0.08384

Traverse Lines : 2

SideShots

Total Hz Dist Traversed: 1088.59878

Total Sl Dist Traversed: 1089.68871

Closure Precision: 1 in 32852.1

Point No.	Horizontal Angle	Zenith Angle	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
Description								

3	AR209.4720	83.2444	124.7850	5.300	4.800	1127305.178	1040918.548	418.6397
CBP ,R&C								
4	AR231.3730	91.2044	964.9270	5.225	5.430	1128194.704	1040545.349	395.7769
CBP ,R&C								

Process Compass Results

Tue Jan 17 20:51:42 2017

Raw File: I:\2016\16001.00 Engineering Survey\16001.30 NYSTA - Four Bridges\Drawings\Surv\Field Files\Site 4\1600130SITE47SG_(Trav 1)_edited.rw5

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Scale Factor: 0.99997981

Correct for Earth Curvature: OFF

Backsight Point 1GPS: N 1127557.5300 E 1042169.2116 Z 400.8244

Adjusted Elevation Comparison

Point#	Original Z	Adjusted Z	Delta Z
3	418.640	418.649	0.009
4	395.777	395.854	0.077

Compass Closure

Adjusted Point Comparison

Point#	Original		Adjusted		Dist	Bearing
	Northing	Easting	Northing	Easting		
3	1127305.180	1040918.549	1127305.182	1040918.544	0.005	N 67°17'37" W
4	1128194.712	1040545.366	1128194.729	1040545.327	0.042	N 67°17'37" W

Max adjustment: 0.042

Point No.	Horizontal Angle	Zenith Angle	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
3	AR209.4722	83.2444	124.7869	5.300	4.800	1127305.181	1040918.544	418.6485
CBP ,R&C								
4	AR231.3725	91.2044	964.9327	5.225	5.430	1128194.728	1040545.327	395.8539
CBP ,R&C								

TRAVERSE 2

Process No Adjust Results

Thu Mar 02 15:26:32 2017

Raw File: I:\2016\16001.00 Engineering Survey\16001.30 NYSTA - Four Bridges\Drawings\Surv\Field Files\Site
4\1600130SITE4S7H_(Trav 2)_TEST.rw5

Coordinate File: I:\2016\16001.00 Engineering Survey\16001.30 NYSTA - Four Bridges\Drawings\Surv\CRD -
Point Database\16001.30 Site 4 COMPS.crd

Scale Factor: 0.99997981

Correct for Earth Curvature: OFF

Closure Results

Starting Point 2GPS: N 1127271.8137 E 1041037.9310 Z 403.8294

Closing Reference Point 7GPS: N 1126459.6292 E 1041324.3344 Z 403.1259

Ending Point 7: N 1126459.6700 E 1041324.3639 Z 403.1216

Azimuth Of Error: 35°53'05"

North Error : 0.04079

East Error : 0.02951

Vertical Error : -0.00435

Hz Dist Error : 0.05034

Sl Dist Error : 0.05053

Traverse Lines : 2

SideShots : 2

Store Points : 4

Horiz Dist Traversed: 879.7749

Slope Dist Traversed: 880.5674

Closure Precision: 1 in 17476.1

Starting Point 2GPS: N 1127271.8137 E 1041037.9310 Z 403.8294

Backsight Point 1GPS: N 1127557.5300 E 1042169.2116 Z 400.8244

Point No. Description	Horizontal Angle	Zenith Angle	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
6 CBP ,R&C	AR106.0654	85.4252	208.7120	5.140	5.330	1127063.809	1041030.883	419.2356
7 CBP ,R&C	AR152.0859	91.2544	671.8750	5.490	4.850	1126459.670	1041324.363	403.1216

Process Angle Balance Results

Thu Mar 02 15:28:15 2017

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4\1600130SITE4S7H_(Trav 2)_TEST.rw5

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Point Database\16001.30 Site 4 COMPS.crd

Scale Factor: 0.99997981

Correct for Earth Curvature: OFF

Closure Results (Before Angle Balance)

Starting Point 2GPS: N 1127271.8137 E 1041037.9310 Z 403.8294

Closing Reference Point 7GPS: N 1126459.6292 E 1041324.3344 Z 403.1259

Ending Point 7: N 1126459.6700 E 1041324.3639 Z 403.1216

Azimuth Of Error: 35°53'05"

North Error : 0.04079

East Error : 0.02951

Vertical Error : -0.00435

Hz Dist Error : 0.05034

Sl Dist Error : 0.05053

Traverse Lines : 2

SideShots : 2

Store Points : 4

Horiz Dist Traversed: 879.7749

Slope Dist Traversed: 880.5674

Closure Precision: 1 in 17476.1

Starting Point 2GPS: N 1127271.8137 E 1041037.9310 Z 403.8294

Backsight Point 1GPS: N 1127557.5300 E 1042169.2116 Z 400.8244

Point No.	Horizontal Angle	Zenith Angle	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
6	AR106.0654	85.4252	208.7120	5.140	5.330	1127063.809	1041030.883	419.2356
CBP ,R&C								
7	AR152.0859	91.2544	671.8750	5.490	4.850	1126459.670	1041324.363	403.1216
CBP ,R&C								

Angle Balance

Angular Error: -0°00'05.92" for 3 traverse sides

Adjusting Each Angle: -0°00'01.97"

Closure Results (After Angle Balance)

Starting Coordinates : N 1127271.8137 E 1041037.9310 Z 403.8294

Closing Reference Point 7GPS: N 1126459.6292 E 1041324.3344 Z 403.1259

Ending Coordinates : N 1126459.6644 E 1041324.3504 Z 403.1216

Azimuth Of Error: 24°22'32"

North Error : 0.03524

East Error : 0.01597

Vertical Error : -0.00435

Hz Dist Error : 0.03869

Sl Dist Error : 0.03894

Traverse Lines : 2

SideShots

Total Hz Dist Traversed: 879.77494

Total Sl Dist Traversed: 880.56742

Closure Precision: 1 in 22738.0

Point No.	Horizontal Angle	Zenith Angle	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
Description								

6	AR106.0656	85.4252	208.7120	5.140	5.330	1127063.809	1041030.881	419.2356
CBP ,R&C								
7	AR152.0901	91.2544	671.8750	5.490	4.850	1126459.664	1041324.350	403.1216
CBP ,R&C								

Process Compass Results

Thu Mar 02 15:28:56 2017

Raw File: I:\2016\16001.00 Engineering Survey\16001.30 NYSTA - Four Bridges\Drawings\Surv\Field Files\Site
4\1600130SITE4S7H_(Trav 2)_TEST.rw5

Coordinate File: I:\2016\16001.00 Engineering Survey\16001.30 NYSTA - Four Bridges\Drawings\Surv\CRD -
Point Database\16001.30 Site 4 COMPS.crd

Scale Factor: 0.99997981

Correct for Earth Curvature: OFF

Backsight Point 1GPS: N 1127557.5300 E 1042169.2116 Z 400.8244

Adjusted Elevation Comparison

Point#	Original Z	Adjusted Z	Delta Z
6	419.236	419.237	0.001
7	403.122	403.126	0.004

Compass Closure

Adjusted Point Comparison

Point#	Original		Adjusted		Dist	Bearing
	Northing	Easting	Northing	Easting		
6	1127063.810	1041030.883	1127063.800	1041030.876	0.012	S 35°53'05" W
7	1126459.670	1041324.364	1126459.629	1041324.334	0.050	S 35°53'05" W

Max adjustment: 0.050

Point No.	Horizontal Angle	Zenith Angle	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
6	AR106.0700	85.4252	208.7167	5.140	5.330	1127063.800	1041030.876	419.2366
CBP ,R&C								
7	AR152.0902	91.2544	671.8787	5.490	4.850	1126459.629	1041324.334	403.1259
CBP ,R&C								

FIELD NOTES FOR TRAVERSE

FOIT-ALBERT ASSOCIATES

PROJECT 16001.30 SITE 4

P.C. mm

WEATHER: 20° WINDY

P.I.N.

CREW: INST. JC

DATE _____

ROD

SHEET: / OF /

H-V coll.
DONE 1-5-17

RAW DATA FILE: 1600130 SITE457G

CONTROL FILE: TRAV 1 NORTH

START POINT: 2-5

POINT NO.	COMMENT
T: 20°F P: 30.08"	KO GPS-2 BS- GPS 1 (HI = 5.30 BS = 5.08) FS- GPS-3 HI = 4.80 HI = -0.043 V = 0.031
T: 20°F P: 30.09"	KO GPS-3 BS- GPS 2 (HI = 5.225 BS = 5.14) FS = GPS 4 HI = 5.43 HI = 0.001 V = 0.048
T: 20°F P: 30.09"	KO GPS-4 BS- GPS 3 (HI = 5.325 BS = 5.06) FS = GPS 5 HI = 5.205 HI = 0.000 V = -0.019

FOIT-ALBERT ASSOCIATES

PROJECT 16001.30 SITE 4

P.C. MM

WEATHER: 20° WIND

P.I.N.

CREW: INST.

DATE _____

ROD

SHEET:

OF

/

H+V collum.
Done 1-5-17

RAW DATA FILE: 1600130SITE457H

CONTROL FILE: TRAVEL SOUTH

START POINT: 6-8

POINT NO.	COMMENT
T: 20°F	K @ GPS-2 BS-GPS-1 (Hi=5.14 BS=5.08)
P: 30.06"	FS=GPS-6 Hi=5.33
	H=-0.037 V=-0.028
T: 20°F	K @ GPS-6 BS-GPS-2 (Hi=5.49 BS=4.93)
P: 30.06"	FS=GPS-7 Hi=4.35
	H=-0.011 V=-0.040
T: 20°F	K @ GPS-7 BS-GPS-6 (Hi=5.02 BS=5.33)
P: 30.07"	FS=GPS-8 Hi=5.01
	H=-0.002 V=-0.015

VERTICAL CONTROL

D214386
New York State Thruway Authority
Design Phase I-IV, Replacement of 8 Syracuse Division Bridges
North Main Street Bridge over Mainline (BIN 5512790)
Mile Post 262.01 in the Syracuse Division
Madison County

VERTICAL CONTROL NARRATIVE

The primary vertical control for the project was established by static GPS methods and distributed throughout project by differential leveling methods. An elevation of 458.6375' on CBP 1 was used and applied to control points and benchmarks set around the project area. Benchmarks CPBM1 through CPBM6 were all set and leveled through using differential leveling methods.

Control Recovered:

N/A

Control Not Recovered:

N/A

Vertical Datum:

North American Vertical Datum 1988.

Closure and Adjustment:

The first level loop began at CBP 1, a set rebar and aluminum cap, and ran through CBP 2, set rebar and aluminum cap and CPBM 2, a set L-cut on the corner of a concrete jersey barrier then closing on CBP 1.

The total length of the first level run was 0.439 miles with a misclosure of 0.000 ft. Using the formula $0.03 \times \text{the square root of } K$, the allowable error was ± 0.020 ft. The misclosure was within tolerance and the level run was then adjusted by distributing the error equally to all the turning points.

The second level loop began at CPBM 2, L-cut on concrete jersey barrier, and ran through CPBM 3, an L-cut on top of concrete jersey barrier, the loop continued through CPBM 1, a set L-cut on top of a concrete abutment wall then closing back on CPBM 2.

The total length of the second level run was 0.199 miles with a misclosure of $+0.003$ ft. Using the formula $0.03 \times \text{the square root of } K$, the allowable error was

+/- 0.013 ft. The misclosure was within tolerance and the level run was then adjusted by distributing the error equally to all the turning points.

The third level loop began at CPBM 4, L-cut on top of a concrete abutment wall, then ran through CBP 7, a set rebar and aluminum cap, the loop continued through CPBM 6, an X-cut on the north bonnet bolt of a hydrant then continued to close back on CPBM 4.

The total length of the third level run was 0.407 miles with a misclosure of +0.003 ft. Using the formula $0.03 \times \text{the square root of } K$, the allowable error was +/- 0.019 ft. The misclosure was within tolerance and the level run was then adjusted by distributing the error equally to all the turning points.

The fourth and final level loop began at CPBM 1, a set L-cut on a concrete abutment wall, then ran through CBP 4, a set rebar and cap, the level continued through CPBM 5, a PK nail set in a utility pole, then the loop continued to close back on CPBM 1.

The total length of the fourth level run was 0.554 miles with a misclosure of +0.021 ft. Using the formula $0.03 \times \text{the square root of } K$, the allowable error was +/- 0.022 ft. The misclosure was within tolerance and the level run was then adjusted by distributing the error equally to all the turning points.

BENCHMARK LIST

Survey Fieldbook Benchmark List Report

Report Created: 2/21/2017

Time: 8:28am

Fieldbook: 1600130 Site 4

Slope Distance Scale Factor: 1.000000000000

Note: All units in this report are in feet unless specified otherwise.

Name	Northing	Easting	Elevation	Description	STA O/S
CPBM1	1127284.0545	1040931.7371	420.641	LCUT ON CONC	NM STA 29+80.99, OS 16.80 L
CPBM2	1127245.4542	1040999.9577	404.434	LCUT ON CONC JB	NM STA 28+47.79, OS 37.06 L
CPBM3	1127125.5554	1041007.7663	404.337	LCUT ON CONC JB	NM STA 27+28.23, OS 25.19 L
CPBM4	1127072.4671	1041030.4361	420.641	LCUT ON CONC WW	NM STA 26+75.94, OS 0.74 L
CPBM 5	1128595.7612	1040336.0228	394.538	MAG NAIL IN UTP	NM STA 44+12.58, OS 58.83 L
CPBM 6	1126108.4822	1041496.9160	406.754	XCUT N BONNET BOLT HYD	NM STA 16+04.63, OS 14.77 R

HORIZONTAL CONTROL POINT ELEVATION LIST

Survey Fieldbook Coordinate List Report

Report Created: 2/21/2017

Time: 8:28am

Fieldbook: 1600130 Site 4

Slope Distance Scale Factor: 1.000000000000

Note: All units in this report are in feet unless specified otherwise.

Number	Northing	Easting	Elevation	Code	Description	STA
1GPS	1127557.5300	1042169.2116	400.824	CBP	REBAR ALUM CAP	ML STA 21+66.80
2GPS	1127271.8137	1041037.9310	403.829	CBP	REBAR ALUM CAP	ML STA 10+00.00 NM STA 28+75.42
2A	1127231.2307	1040864.4245	404.671	CBS	REBAR AND CAP	
3	1127305.1816	1040918.5443	418.649	CBP	REBAR AND CAP	NM STA 29+99.38
3A	1127683.5344	1040745.3767	404.194	CBS	REBAR AND CAP	
4GPS	1128194.7285	1040545.3270	395.854	CBP	REBAR AND CAP	NM STA 39+64.05
4A	1126561.1102	1041175.3589	401.917	CBS	MAG NAIL	
4B	1126507.6726	1041305.2350	403.405	CBS	MAG NAIL	
5GPS	1129132.9058	1040202.2241	395.301	CBP	REBAR AND CAP	NM STA 49+63.00
6	1127063.7818	1041030.8800	419.237	CBP	REBAR AND CAP	NM STA 26+67.27
7GPS	1126459.6292	1041324.3344	403.126	CBP	REBAR AND CAP	NM STA 19+95.62
8GPS	1125550.1570	1041729.4487	410.918	CBP	REBAR ALUM CAP	NM STA 10+00.00

LEVEL LOOP NO. 1

FOIT-ALBERT ASSOCIATES

PROJECT	16001.30	DATUM	NAVD88	UNITS	FT	INSTRUMENT:	LEICA DNA03	DATE	11-1-16	WEATHER	CLOUDY	50'S	P.C.	JS	INST.	MM	ROD	SHEET	1 OF 2
P.L.N.	SITE 4	SERIAL NO.:	333205																
TURN	3 WIRE BS	BS (+)	HI	3 WIRE FS	FS (-)	ELEV.	ADJ. ELEV.	DESCRIPTION	DISTANCE + -										
TP1	5.970	5.240	406.0644			400.8244		CBP 1 REBAR WITH ALUMINUM CAP	146.5'										
	5.240																		
	4.505																		
TP2	5.220	4.450	404.8314						153.5										
	4.450																		
	3.685																		
TP3	5.725	5.025	404.6044			399.5794			139.5										
	5.025																		
	4.330																		
TP4	6.180	5.550	406.7944			401.2444			158.5										
	5.550																		
	4.920																		
SS						403.8294		CBP 2 REBAR WITH ALUMINUM CAP	120.5										
TP5	3.750	3.145	406.9744			404.4344		CPBM 2 L-CUT ON CONC JERSEY BARRIER	120.5										
	3.145																		
	2.545																		
	4.680	3.960	405.3094			401.3494			144.5										
	3.960																		
	3.235																		

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LEVEL LOOP NO. 2

FOIT-ALBERT ASSOCIATES

PROJECT 16001.30		SITE 4		DATUM	UNITS	INSTRUMENT: LEICA DUA 03		DATE	WEATHER	P.C.	INST.	ROD	SHEET
P.L.N.				NAD 88	FT	SERIAL NO.: 333205		11/2/16	CLOUDY	60'S	JS	MM	1 OF 2
TURN	3 WIRE BS	BS (+)	HI	3 WIRE FS	FS (-)	ELEV.	ADJ. ELEV.	DESCRIPTION		DISTANCE			
	2.840	2.483	406.9174		2.580	404.4344	404.3369	CPBM 2 L-CUT ON CONC JERSEY BARRIER		71.0		92.5	
	2.483												
	2.130												
TP1	18.550	18.230	422.5674		3.715	418.8524	418.8514	CPBM 3 L-CUT ON CONC JERSEY BARRIER		63.0		65.0	
	18.230												
	17.920												
TP2	4.915	4.740	423.5924		2.950	420.6424	420.6409	CPBM 4 L-CUT ON CONC BRIEFT ABUTMENT WALL		35.5		34.5	
	4.740												
	4.560												
TP3	6.650	6.000	426.6424		5.990	420.6524	420.6504	CPBM 1 L-CUT ON CONC BRIEFT ABUTMENT WALL		130.5		112.0	
	6.000												
	5.345												
TP4	1.760	1.530	422.1824		18.345	403.8374	403.8349	CBP 2 REBAR WITH ALUMI CAP		45.5		134.0	
	1.530												
	1.305												
TP5	5.645	5.525	409.3624		4.925	404.4374	404.4344			24.0		24.5	
	5.525												
	5.405												
TP6	5.095	4.800											
	4.925												
	4.800												

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SUM = 369.5 683

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[illegible]

LEVEL LOOP NO. 3

FOIT-ALBERT ASSOCIATES

Loop 3

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PROJECT	16001.30	DATUM	UNITS	INSTRUMENT:	DATE	WEATHER	P.C.	INST.	ROD	SHEET
P.I.N.	SITE 4 N. MAIN ST.	NAVD 88	FT	SERIAL NO.: 333205	1-5-17	20° WIND	mm	JC		1 OF 2
TURN	3 WIRE BS	BS (+)	HI	3 WIRE FS	FS (-)	ELEV.	ADJ. ELEV.	DESCRIPTION	DISTANCE +	-
RP-1	1.894									
	1.460	1.460	412.1009			4120.6409		CBM-4 "L" CUT ON CONC BRIDGE ABUTMENT WALL	86.9	
	1.025			7.542 7.032 6.524	7.032	415.0689	415.0985			101.8
RP-2	1.330									
	0.915	0.915	415.9839						83.0	
	0.500			8.663 8.115 7.572	8.115	407.8689	407.8689			109.1
RP-3	2.310									
	1.637	1.637	409.5059						135.0	
	0.860			7.210 6.380 5.548	6.380	403.1259	403.1259	CBP-7 R+C ELEV = 403.1259		166.2
RP-4	7.945									
	7.085	7.085	410.2109						172.0	
	6.225			4.560 3.455 2.350	3.455	406.7559	406.7559	CBP-6 "X" CUT ON NORTH BONNET ISLET OF NYD		221.0
RP-5	4.450									
	3.345	3.345	410.1009						221.0	
	2.240			7.830 6.972 6.115	6.972	403.1289	403.1270	CBP-7 R+C ELEV = 403.1259		171.5
RP-6	7.020									
	6.270	6.270	4109.3989						150.0	
	5.520			2.285 1.525 0.765	1.525	407.8739	407.8711			152.0

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[illegible]

LEVEL LOOP NO. 4

FOIT-ALBERT ASSOCIATES

PROJECT 16001.30		DATUM	UNITS	INSTRUMENT: LEICA DNA-03		DATE	WEATHER	P.C.	INST.	ROD	SHEET
P.L.N. SITE 4 N. MAIN ST.		MAVB 88	FT	SERIAL NO.: 333205		1-11-17	45° 50' N	mm	5C		2 OF 3
TURN	3 WIRE BS	BS (+)	HI	3 WIRE FS	FS (-)	ELEV.	ADJ. ELEV.	DESCRIPTION		DISTANCE +	-
RP-7	5.215			7.522				CPBEN-5 PKN SET IN UTP			
	4.745	4.745	401.6364	7.088	7.088	394.5484	394.5379			94.3	87.2
	4.272			6.650							
RP-8	7.360			6.925							
	6.925	6.925	401.4734							87.0	
	6.490										
RP-9	5.725			5.645							
	4.985	4.985	401.5684	4.890	4.890	396.5834	396.5714			148.3	150.5
	4.242			4.140							
35				6.065				CBP-4 R+C			
				5.694	5.694	395.8744					
				5.325							
RP-9	6.362			6.300							
	5.582	5.582	401.6454	5.505	5.505	396.0634	396.0499			156.2	159.0
	4.800			4.710							
RP-10	8.670			4.669							
	8.185	8.185	405.6604	4.170	4.170	397.4754	397.4604			99.9	
	7.705			3.670							
RP-11				2.175							
	9.060			1.670	1.670	403.9904	403.9139			96.5	100.5
	8.558	8.558		1.170							
	8.050										
										101.0	

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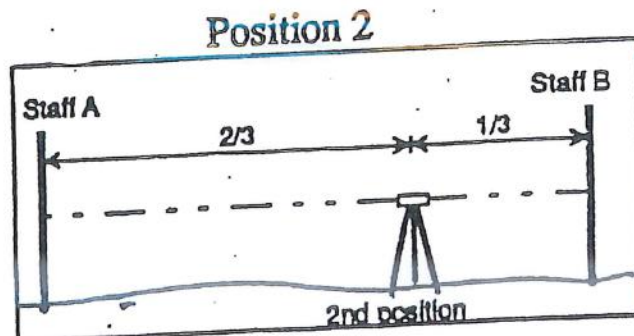
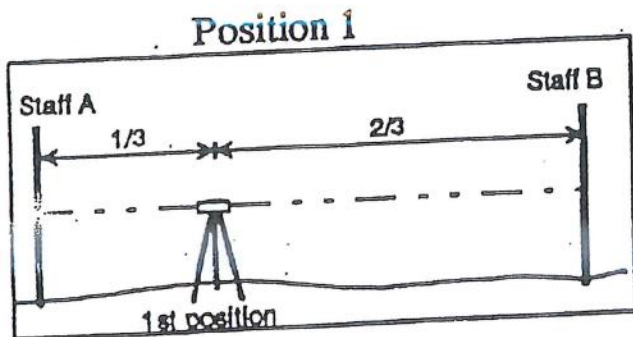
FOIT-ALBERT ASSOCIATES

PROJECT 16001.30		P.I.N. 5764 N. MAIN ST		DATUM	UNITS	INSTRUMENT: LEICA DNA 03		DATE	WEATHER	P.C.	INST.	ROD	SHEET
				MAVD 88	FT	SERIAL NO.: 333205		1-11-17	45° SUN	mm	5C		3 OF 3
TURN	3 WIRE BS	BS (+)	HI	3 WIRE FS	FS (-)	ELEV.	ADJ. ELEV.	DESCRIPTION		DISTANCE			
TP-12	8.532			1.730	1.248	411.3004	411.2824						
	8.110	8.110	419.4104	0.760									
	7.695												
TP-13	7.400			3.415	3.038	416.3724	416.3524						
	7.120	7.120	423.4924	3.038									
	6.843			2.659									
TP-14				3.138	2.819	420.6734	420.6524						
				2.819									
				2.495									
						420.6734							
						-420.6524							
						+0.021							
						-0.021/14							
						0.03/0.5535							
						0.022							
						-0.021 ✓							
						-0.0015 / TURN							

PEG TESTS

DB 16001.30 STANTEC SITE 4
SHEET NO. 1 OF

CALCULATED BY JS DATE 11.2.16
CHECKED BY DATE
SCALE NTS



1ST SET-UP

A 3.885

B 4.210

Δ ELEV -0.325 ($A' - B'$)

DIFF 0.005 ✓

Δ COLLIMATION

ABSOLUTE COLLIMATION

CALCULATED ROD READING FOR CHECK @ A2

ACTUAL ROD READING @ A2 (AFTER ELECTRONIC CALIBRATION)

2ND SET-UP

B 3.820

A 3.490

Δ ELEV 0.33 ($B^2 - A^2$)

DATE: 11.2.16

INST.: LEICA DNA 03

P.L.: JS

PROJECT: 16001.30 SITE 4

PER. NO.:

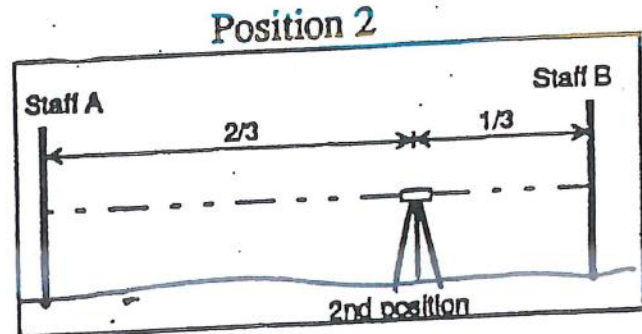
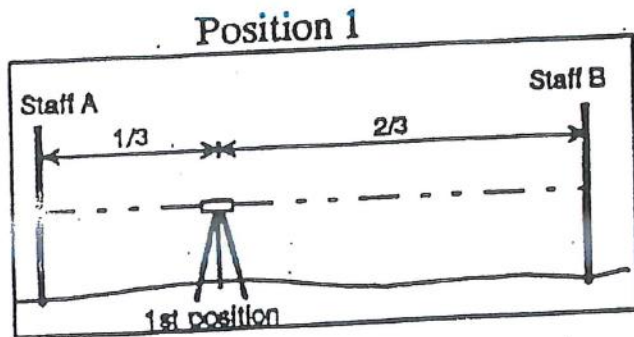
π : MM



Foit-Albert Associates
Architecture, Engineering and Surveying, P.C.

OB 16001.30 SITE 4 N. MAIN ST.
HEET NO. _____ OF _____

CALCULATED BY MM, JC DATE 1-5-17
CHECKED BY ZOO WINDY DATE _____
SCALE N.T.S.



1ST SET-UP

A 5.764

B 4.583

Δ ELEV 1.181 ($A' - B'$)

DIFF -0.005 ✓

Δ COLLIMATION _____
ABSOLUTE COLLIMATION _____

CALCULATED ROD READING FOR CHECK @ A2 _____

ACTUAL ROD READING @ A2 (AFTER ELECTRONIC CALIBRATION) _____

2ND SET-UP

B 4.828

A 6.004

Δ ELEV -1.176 ($B^2 - A^2$)

DATE: 1-5-17

INST.: LEICA DNA03

P.C.: MM

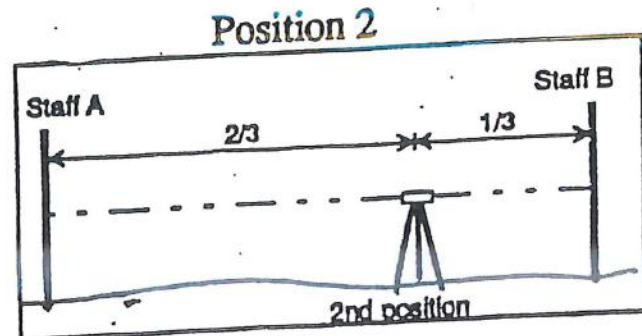
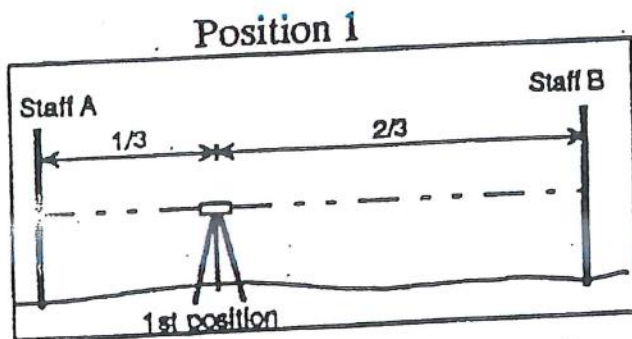
PROJECT: 16001.30 SITE 4

PER. NO.: _____

π : JC

OB 16001.30
HEET NO. _____ OF _____

CALCULATED BY MM, JC DATE 1-6-16
CHECKED BY 12° SNOWS DATE _____
SCALE NTS



1ST SET-UP

A 5.160

B 4.730

Δ ELEV 0.430 ($A' - B'$)

DIFF +0.002 ✓

Δ COLLIMATION _____
ABSOLUTE COLLIMATION _____

CALCULATED ROD READING FOR CHECK @ A2 _____

ACTUAL ROD READING @ A2 (AFTER ELECTRONIC CALIBRATION) _____

2ND SET-UP

B 4.940

A 5.368

Δ ELEV -0.428 ($B^2 - A^2$)

DATE: 1-6-16

INST.: LEICA DNA 03

P.R.: mm

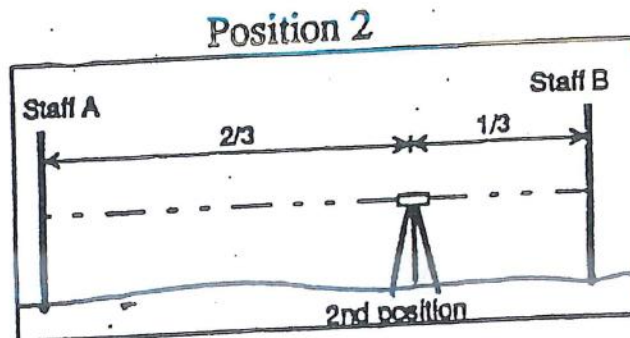
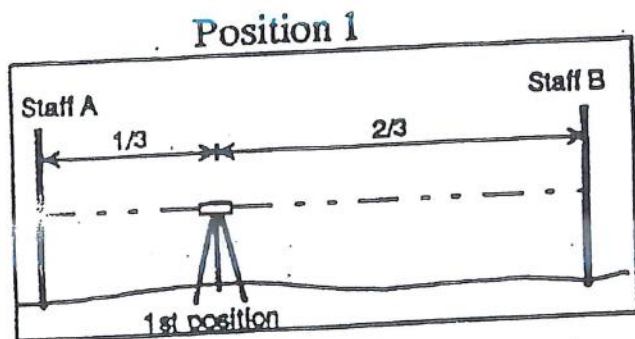
PROJECT: 16001.30 SHE4

PER. NO.: _____

π : 52

DB 10001.30 SITE 4 N. MAIN
SHEET NO. _____ OF _____

CALCULATED BY MM, Jr DATE 1-11-17
CHECKED BY 45° SUN DATE _____
SCALE NTS



1ST SET-UP

A 4.852

B 6.032

Δ ELEV -1.18 ($A' - B'$)

DIFF +0.005 ✓

Δ COLLIMATION _____
ABSOLUTE COLLIMATIONS _____

CALCULATED ROD READING FOR CHECK @ A2 _____

ACTUAL ROD READING @ A2 (AFTER ELECTRONIC CALIBRATION) _____

2ND SET-UP

B 5.695

A 4.510

Δ ELEV 1.185 ($B^2 - A^2$)

DATE: 1-11-17

INST.: LEICA DNA-03

P.C.: MM

PROJECT: 10001.30 SITE 4

PER. NO.: _____

π : π

EQUIPMENT DATA SHEETS

TRIMBLE S6 TOTAL STATION

KEY FEATURES

Now available with **Trimble VISION** technology for video robotic control and scene documentation

Powerful and flexible, ready for anything

Trimble DR Plus technology for long range and superior accuracy

Unmatched fast and smooth performance with **MagDrive servo technology**

Trimble SurePoint accuracy assurance automatically corrects instrument pointing



POWERFUL AND FLEXIBLE

The Trimble® S6 Total Station provides the power and flexibility required by today's Surveying Professionals. With the industry's most advanced technology and available feature set, the Trimble S6 Total Station will meet the changing needs of your business, allowing your investment to go further.

TRIMBLE VISION TECHNOLOGY

Now available with optional Trimble VISION™ technology, the Trimble S6 gives you the power to see everything the instrument sees without a trip back to the tripod. Direct your survey with live video images on the controller. Now you are free to capture measurements, to prism or reflectorless surfaces, remotely, and with point-and-click efficiency.

The on-board camera integrates surveyed data with the live scene images, so you can verify the work that you've done before leaving the job site. Calibrated photo documentation provides customers with deliverables they know they can trust.

TRIMBLE DR PLUS TECHNOLOGY

Trimble DR Plus™ range measurement technology provides extended range of Direct Reflex measurement without a prism to exceptionally long range distances. Hard-to-reach or unsafe targets are no obstacle to the Trimble S6. Trimble DR Plus, combined with MagDrive™, creates unmatched capability for quick and safe measurements, without compromising on accuracy.

MAGDRIVE SERVO TECHNOLOGY

The Trimble S6 Total Station redefines surveying instrument performance with unsurpassed integration of servos, angle sensors and measurement technology. The instrument's advanced error compensation provides fast, accurate measurement every time. With smooth, silent MagDrive servo motors, the Trimble S6 offers exceptional speed.

TRIMBLE SUREPOINT ACCURACY ASSURANCE

The Trimble S6 Total Station aims and stays on target through windy weather, vibrations, handling, and sinkage. Trimble SurePoint™ technology enables the Trimble S6 to actively correct for unwanted movement ensuring accurate pointing and measurement every time. Reduce aiming error, avoid costly re-measurement and be confident in your results with Trimble SurePoint.

With its exclusive MultiTrack™ technology and Target ID capabilities, surveyors can choose the type of target, passive or active, that best suits the jobsite conditions and be confident that they will find and lock to the correct target.

ELIMINATE SEARCH TIME WITH GPS SEARCH

With GPS Search the Trimble S6 locks onto a prism in just seconds. Using a consumer grade GPS card with Bluetooth receiver or your survey grade GNSS in a Trimble I.S. rover configuration, GPS Search uses GPS positioning at the robotic rod to locate or reacquire targets rapidly. With GPS Search, waiting for target search becomes a thing of the past.

INTEGRATED SURVEYING

Put the equipment in your truck or van to the best possible use by combining your GNSS with your robotic rod into a Trimble I.S. Rover™. In clear sky, enjoy the high productivity of GNSS measurements. In obstructed areas, Trimble Access seamlessly switches to optical measurements. Or collect both GNSS and optical data simultaneously for redundant results. With the Trimble I.S. Rover, you have the freedom to use the best tool for the jobsite conditions, optimizing your productivity.

TRIMBLE S6 DR PLUS

PERFORMANCE

Angle measurement	
Sensor type	Absolute encoder with diametrical reading
Accuracy (Standard deviation based on DIN 18723)	.2" (0.6 mgon)
	3" (1.0 mgon), or 5" (1.5 mgon)
Angle Display (least count)	0.1" (0.01 mgon)
Automatic level compensator	
Type	Centered dual-axis
Accuracy	0.5" (0.15 mgon)
Range	± 5.4' (±100 mgon)
Distance measurement	
Accuracy (RMSE)	
Prism mode	
Standard	2 mm + 2 ppm (0.0065 ft + 2 ppm)
Standard deviation according to ISO17123-4	1 mm + 2 ppm (0.003 ft + 2 ppm)
Tracking	4 mm + 2 ppm (0.013 ft + 2 ppm)
DR mode	
Standard	2 mm + 2 ppm (0.0065 ft + 2 ppm)
Tracking	4 mm + 2 ppm (0.013 ft + 2 ppm)
Measuring time	
Prism mode	
Standard	1.2 sec
Tracking	0.4 sec
DR mode	
Standard	1–5 sec
Tracking	0.4 sec
Range	
Prism mode (under standard clear conditions ^{1,2})	
1 prism	2500 m (8202 ft)
1 prism Long Range mode	5500 m (18,044 ft) (max. range)
Shortest range	0.2 m (0.65 ft)

DR mode

	Good (Good visibility, low ambient light)	Normal (Normal visibility, moderate sunlight, some heat shimmer)	Difficult (Haze, object in direct sunlight, turbulence)
White card (90% reflective) ³	1,300 m (4,265 ft)	1,300 m (4,265 ft)	1,200 m (3,937 ft)
Gray card (18% reflective) ³	600 m (1,969 ft)	600 m (1,969 ft)	550 m (1,804 ft)

Shortest range	1 m (3.28 ft)
DR Ranges (typically)	
Concrete	600 m–800 m (1968–2624 ft)
Wood construction	400 m–800 m (1312–2624 ft)
Metal construction	400 m–500 m (1312–1640 ft)
Light rock	400 m–600 m (1312–1968 ft)
Dark rock	300 m–400 m (984–1312 ft)
Reflective foil 20 mm	1000 m (3280 ft)
DR Extended Range Mode	
White Card (90% reflective) ³	2000 m–2200 m
Gray Card (18% reflective) ³	900 m–1000 m
Accuracy	10 mm + 2 ppm (0.033 ft + 2 ppm)
Camera	
Chip	Color Digital Image Sensor
Resolution	2048 x 1536 pixels
Focal length	23 mm (0.07 ft)
Depth of field	3 m to infinity (9.84 ft to infinity)
Field of view	16.5° x 12.3° (18.3 gon x 13.7 gon)
Digital zoom	4-step (1x, 2x, 4x, 8x)
Exposure	Automatic
Brightness	User-definable
Contrast	User-definable
Image storage	Up to 2048 x 1536 pixels
File format	JPEG

GENERAL SPECIFICATIONS

EDM SPECIFICATIONS

Light source	Pulsed laserdiode 905 nm, Laser class 1
Laser pointer coaxial (standard)	Laser class 2
Beam divergence	
Horizontal	4 cm/100 m (0.13 ft/328 ft)
Vertical	8 cm/100 m (0.26 ft/328 ft)
Atmospheric correction	–130 ppm to 160 ppm continuously

Leveling

Circular level in tribrach	8'2 mm (8'0.007 ft)
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Servo system	MagDrive servo technology, integrated servo/angle sensor electromagnetic direct drive
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Rotation speed	115 degrees/sec (128 gon/sec)
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Rotation time Face 1 to Face 2	2.6 sec
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Positioning time 180 degrees (200 gon)	2.6 sec
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Clamps and slow motions	Servo-driven, endless fine adjustment
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Centering

Centering system	Trimble 3-pin
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Optical plummet	Built-in optical plummet
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Magnification/shortest focusing distance	2.3x/0.5 m–infinity (1.6 ft–infinity)
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Telescope

Magnification	30x
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Aperture	40 mm (1.57 in)
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Field of view at 100 m (328 ft)	2.6 m at 100 m (8.5 ft at 328 ft)
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Shortest focusing distance	1.5 m (4.92 ft)–infinity
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Illuminated crosshair	Variable (10 steps)
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Tracklight built in	Not available in all models
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Operating temperature	–20 °C to +50 °C (–4 °F to +122 °F)
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Dust and water proofing	IP55
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Humidity	100% condensing
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Power supply

Internal battery	Rechargeable Li-Ion battery 11.1 V, 5.0 Ah
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Operating time⁴

One internal battery	Approx. 6.5 hours
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Three internal batteries in multi-battery adapter	Approx. 20 hours
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Robotic holder with one internal battery	13.5 hours
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Operating time for video robotic⁴

One battery	5.5 hours
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Three batteries in multi-battery adapter	17 hours
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Weight

Instrument (servo/Autolock)	5.15 kg (11.35 lb)
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Instrument (Robotic)	5.25 kg (11.57 lb)
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Trimble CU controller	0.4 kg (0.88 lb)
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Tribrach	0.7 kg (1.54 lb)
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Internal battery	0.35 kg (0.77 lb)
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Trunnion axis height	196 mm (7.71 in)
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Communication	USB, Serial, Bluetooth [®]
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Security	Dual-layer password protection; available on some models
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TRIMBLE S6 TOTAL STATION

ROBOTIC SURVEYING

Autolock and Robotic Range ²	
Passive prisms	500 m–700 m (1,640–2,297 ft)
Trimble MultiTrack Target	800 m (2,625 ft)
Autolock pointing precision at 200 m (656 ft) (Standard deviation) ²	
Passive prisms	<2 mm (0.007 ft)
Trimble MultiTrack Target	<2 mm (0.007 ft)
Shortest search distance	0.2 m (0.65 ft)
Type of radio internal/external	2.4 GHz frequency-hopping, spread-spectrum radios
Search time (typical) ⁶	2–10 sec

GPS SEARCH/GEOLOCK WITH THE TRIMBLE MULTITRACK TARGET

GPS Search/GeoLock	360 degrees (400 gon) or defined horizontal and vertical search window
Solution acquisition time ⁷	15–30 sec
Target re-acquisition time	<3 sec
Range	Autolock & Robotic range limits

- 1 Standard clear; No haze. Overcast or moderate sunlight with very light heat shimmer.
- 2 Range and accuracy depend on atmospheric conditions, size of prisms and background radiation.
- 3 Kodak Gray Card, Catalog number E1527795.
- 4 The capacity in -20 °C (-5 °F) is 75% of the capacity at +20 °C (68 °F).
- 5 Bluetooth type approvals are country specific. Contact your local Trimble Authorized Distribution Partner for more information.
- 6 Dependent on selected size of search window.
- 7 Solution acquisition time is dependent upon solution geometry and GPS position quality.

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Specifications subject to change without notice.



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DATASHEET

TRIMBLE R8 GNSS RECEIVER

KEY FEATURES

Advanced Trimble R-Track technology

Unmatched GNSS tracking performance

Includes Trimble Maxwell 6 chip with 220 channels

Remote configuration and access

Base and rover communications options to suit any application



The Trimble® R8 GNSS Receiver sets the new standard for full-featured GNSS (Global Navigation Satellite System) receiver technology. This integrated system delivers unmatched power, accuracy and performance in a rugged, compact unit.

ADVANCED TRIMBLE R-TRACK TECHNOLOGY

The Trimble R8 GNSS delivers the latest advancements in R-Track™ technology, designed to deliver reliable, precise positioning performance. In challenging areas for GNSS surveying, such as tree cover or limited sky view, Trimble R-Track provides unmatched tracking performance of GNSS satellite signals.

Trimble R-Track with Signal Prediction™ compensates for intermittent or marginal RTK correction signals, enabling extended precision operation after an RTK signal is interrupted.

The new CMRx communications protocol provides unprecedented correction compression for optimized bandwidth and full utilization all of the satellites in view, giving you the most reliable positioning performance.

Featuring the Trimble Maxwell™ 6 chip, the Trimble R8 GNSS advances the industry with more memory and more GNSS channels. Trimble delivers business confidence with a sound GNSS investment for today and into the future.

Broad GNSS Support

The Trimble R8 GNSS supports a wide range of satellite signals, including GPS L2C and L5 and GLONASS L1/L2 signals. In addition, Trimble is committed to the next generation of modernized GNSS configurations by providing Galileo-compatible products available for customers well in advance of Galileo system availability^{1,2}. In support of this plan, the new Trimble R8 GNSS is capable of tracking the experimental GIOVE-A and GIOVE-B test satellites for signal evaluation and test purposes.

FLEXIBLE SYSTEM DESIGN

The Trimble R8 GNSS receiver combines the most comprehensive feature set into an integrated and flexible system for demanding surveying applications. The Trimble R8 GNSS includes a built-in transmit/receive UHF radio,

enabling ultimate flexibility for rover or base operation. As a base station, the internal NTRIP caster provides you with customized access³ to base station corrections via the internet.

Trimble's exclusive, Web UI™ eliminates travel requirements for routine monitoring of base station receivers. Now you can assess the health and status of base receivers and perform remote configurations from the office. Likewise, you can download post-processing data through Web UI and save additional trips out to the field.

ENABLING THE CONNECTED SITE

Pair the speed and accuracy of the Trimble R8 GNSS receiver with flexibility and collaboration tools of Trimble Access™ software. Trimble Access brings field and office teams closer by enabling data sharing and collaboration in a secure, web-based environment. With optional streamlined workflows, Trimble Access further empowers surveyors and survey teams for success. Now it is easier than ever to realize the potential of the Trimble Connected Site. Connecting the right tools, techniques, services and relationships enables surveying businesses to achieve more every day.

¹ Galileo Commercial Authorization

Receiver technology having Galileo capability to operate in the Galileo frequency bands and using information from the Galileo system for future operational satellites is restricted in the publicly available Galileo Open Service Signal-in-Space Interface Control Document (GAL OS SIS ICD) and is not currently authorized for commercial use.

Receiver technology that tracks the GIOVE-A and GIOVE-B test satellites uses information that is unrestricted in the public domain in the GIOVE-A + B Navigation Signals-in-Space Interface Control Document. Receiver technology having developmental GIOVE-A and B capability is intended for signal evaluation and test purposes.

² For more information about Trimble and GNSS modernization, please visit http://www.trimble.com/srv_new_era.shtml.

³ Cellular modem required.



TRIMBLE R8 GNSS RECEIVER

PERFORMANCE SPECIFICATIONS

Measurements

- Trimble R-Track technology
- Advanced Trimble Maxwell 6 Custom Survey GNSS chip with 220 channels
- High precision multiple correlator for GNSS pseudorange measurements
- Unfiltered, unsmoothed pseudorange measurements data for low noise, low multipath error, low time domain correlation and high dynamic response
- Very low noise GNSS carrier phase measurements with <1 mm precision in a 1 Hz bandwidth
- Signal-to-Noise ratios reported in dB-Hz
- Proven Trimble low elevation tracking technology
- Satellite signals tracked simultaneously:
 - GPS: L1C/A, L2C, L2E (Trimble method for tracking L2P), L5
 - GLONASS: L1C/A, L1P, L2C/A (GLONASS M only), L2P
 - SBAS: L1C/A, L5
 - Galileo GIOVE-A and GIOVE-B

Code differential GNSS positioning¹

Horizontal..... 0.25 m + 1 ppm RMS
Vertical..... 0.50 m + 1 ppm RMS
WAAS differential positioning accuracy²..... typically <5 m 3DRMS

Static and FastStatic GNSS surveying¹

Horizontal..... 3 mm + 0.1 ppm RMS
Vertical..... 3.5 mm + 0.4 ppm RMS

Kinematic surveying¹

Horizontal..... 10 mm + 1 ppm RMS
Vertical..... 20 mm + 1 ppm RMS
Initialization time³..... typically <10 seconds
Initialization reliability⁴..... typically >99.9%

HARDWARE

Physical

Dimensions (WxH)..... 19 cm x 11.2 cm (7.5 in x 4.4 in), including connectors
Weight..... 1.34 kg (2.95 lb) with internal battery, internal radio, standard UHF antenna.
3.70 kg (8.16 lb) entire RTK rover including batteries, range pole, controller and bracket
Temperature⁵
Operating..... -40 °C to +65 °C (-40 °F to +149 °F)
Storage..... -40 °C to +75 °C (-40 °F to +167 °F)
Humidity..... 100%, condensing
Water/dustproof..... IP67 dustproof, protected from temporary immersion to depth of 1 m (3.28 ft)

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Shock and vibration..... Tested and meets the following environmental standards:

Shock..... Non-operating: Designed to survive a 2 m (6.6 ft) pole drop onto concrete. Operating: to 40 G, 10 msec, sawtooth

Vibration..... MIL-STD-810F, FIG.514.5C-1

Electrical

- Power 11 to 28 V DC external power input with over-voltage protection on Port 1 (7-pin Lemo)
- Rechargeable, removable 7.4 V, 2.4 Ah Lithium-Ion battery in internal battery compartment. Power consumption is 3.2 W, in RTK rover mode with internal radio. Operating times on internal battery:
 - 450 MHz receive only option..... 5.8 hours⁷
 - 450 MHz receive/transmit option..... 3.7 hours⁸
 - GSM/GPRS..... 4.1 hours⁹
- Certification Class B Part 15, 22, 24 FCC certification, 850/1900 MHz. Class 10 GSM/GPRS module, CE Mark approval, and C-tick approval

Communications and Data Storage

- 3-wire serial (7-pin Lemo) on Port 1. Full RS-232 serial on Port 2 (Dsub 9 pin)
- Fully Integrated, fully sealed internal 450 MHz receiver/transmitter option:
 - Transmit power: 0.5 W
 - Range⁶: 3–5 km typical / 10 km optional
- Fully integrated, fully sealed internal GSM/GPRS option⁷
- Fully integrated, fully sealed 2.4 GHz communications port (Bluetooth®)⁹
- External cellphone support for GSM/GPRS/CDPD modems for RTK and VRS operations
- Data storage on 57 MB internal memory: 40.7 days of raw observables (approx. 1.4 MB /Day), based on recording every 15 seconds from an average of 14 satellites
- 1 Hz, 2 Hz, 5 Hz, 10 Hz, and 20 Hz positioning
- CMR+, CMRx, RTCM 2.1, RTCM 2.3, RTCM 3.0, RTCM 3.1 Input and Output
- 16 NMEA outputs, GSO, RT17 and RT27 outputs. Supports BINEX and smoothed carrier

1 Accuracy and reliability may be subject to anomalies due to multipath, obstructions, satellite geometry, and atmospheric conditions. Always follow recommended survey practices.

2 Depends on WAAS/EGNOS system performance.

3 May be affected by atmospheric conditions, signal multipath, obstructions and satellite geometry.

4 May be affected by atmospheric conditions, signal multipath, and satellite geometry. Initialization reliability is continuously monitored to ensure highest quality.

5 Receiver will operate normally to -40 °C. Internal batteries are rated to -20 °C.

6 Varies with terrain and operating conditions.

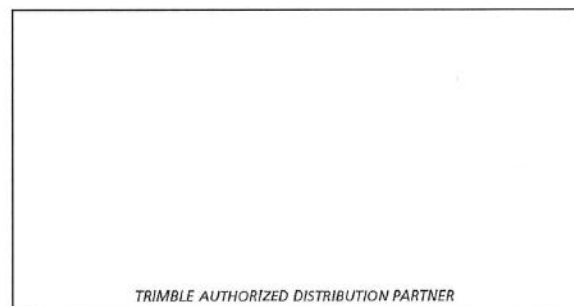
7 Varies with temperature.

8 Varies with temperature and wireless data rate.

9 Bluetooth type approvals are country specific.

Contact your local Trimble Authorized Distribution Partner for more information.

Specifications subject to change without notice.



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www.trimble.com

LEICA digital levels at a glance

Technical data	LEICA DNA03	LEICA DNA10
Area of use	<ul style="list-style-type: none"> – Quick measurements of heights, height differences and stake outs – I. and II. order levelling – Precision measurements 	<ul style="list-style-type: none"> – Quick measurements of heights, height differences and stake outs – Cadastral levelling – Technical levelling
Accuracy	Standard deviation height measurement per 1km double-run (ISO 17123-2)	
Electronic measurements: with Invar staffs	0.3mm	0.9mm
with standard staffs	1.0mm	1.5mm
Optical measurements	2.0mm	2.0mm
Standard deviation distance measurement (electr.)	1cm/20m (500ppm)	
Range		
Electronic measurement	1.8m – 110m	
Optical measurement	from 0.6m	
Electronic measurement		
Resolution height measurement	0.01mm, 0.0001ft, 0.0005inch	0.1mm, 0.001ft
Time for single measurement	typically 3 seconds	
Measurement modes	Single, average, median, repeated single measurements	
Measurement programs	Measure & Record, staff height/distance BF, aBF, BFFB, aBFFB	
Coding	Remark, Free code, Quick code	
Data storage		
Internal memory	6000 measurements or 1650 station	
Backup	PCMCIA card (ATA-Flash/SRAM) SRAM compatible with Omnidrive MCR4	
Online operations	GSI format via RS232	
Data exchange internal memory	GSI8/GSI16/XML/flexible formats	
Telescope magnification	24x	
Compensator		
Type	Pendulum compensator with magnetic damping	
Slope range	±10'	
Compensator setting accuracy	0.3"	0.8"
Display	LCD, 8 lines at 24 characters	
Battery operated		
GEB111	12h operation	
GEB121	24h operation	
Battery adapter GAD39	Alkaline battery, 6x LR6/AA/AM3, 1.5V	
Weight	2.8kg (incl. battery GEB111)	
Environmental conditions		
Working temperature	–20°C to +50°C	
Storage temperature	–40°C to +70°C	
Dust/water (IEC60529)	IP53	
Humidity	95%, non condensing	



Total Quality Management
is our commitment to total
customer satisfaction.

For more information about
our TQM program, ask
your local Leica Geosystems
agent.

Leica
Geosystems

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(Switzerland)

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Fax +41 71 727 46 73

www.leica-geosystems.com

Certificate Of Calibration

Calibration Date: 3/4/2016

Instrument Model: Trimble S6

Serial Number: 99010506

Technician: George Scott

Next Due Date: 3/4/2017

Before:

X/H: 0.0019g

Y/V: -77.6066g

H: -0.0008g

V: -77.6139g

Angles / Axis:

Autolock:

C.P. ✓

Mall: ✓

EDM: ✓

Radio: ✓

After:

X/H: 0.0018g

Y/V: -77.6081g

H: -0.0004g

V: -77.6104g

1670 East Race Street

Allentown, PA 18109

1-800-833-9250

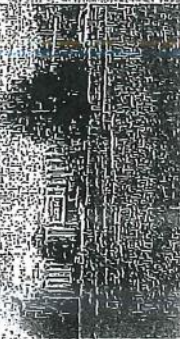
WWW.KEYPRE.COM

This certificate confirms that the above instrument has been inspected, calibrated, and is working within the manufacturer's specifications by

The calibration of this instrument is guaranteed to be within product specifications when the unit leaves Keystone Precision Instruments. Neither Keystone Precision Instruments or representative will assume liability incurred during use of this unit should unit lose calibration.



Preferred Service Provider



COMPUTER FILES

D214386
New York State Thruway Authority
Design Phase I-IV, Replacement of 8 Syracuse Division Bridges
North Main Street Bridge over Mainline (BIN 5512790)
Mile Post 262.01 in the Syracuse Division
Madison County

List of Computer Files

D214386_map_surv_base_site 4_3D.dgn
D214386_map_surv_points_site 4_3D.dgn
D214386_map_surv_dtm_site 4_3D.dgn
D214386_map_surv_text_site 4_2D.dgn
D214386_map_surv_control_site 4_3D.dgn
D214386_map_surv_bridge deck_site 4.dtm
D214386_map_surv_existing ground_site 4.dtm
D214386_dat_surv_site 4.fwd

List of Field Files

1600130SITE4.csv
1600130SITE4A.csv
1600130SITE4B.csv
1600130SITE4C.csv
1600130SITE4D.csv
1600130SITE4E.csv
1600130SITE4F.csv
1600130SITE4G.csv
1600130SITE4H.csv
1600130SITE4I.csv
1600130SITE4J.csv
1600130SITE4K.csv
1600130SITE4L.csv
1600130SITE4M.csv
1600130SITE4S6A.rw5
1600130SITE4S6B.rw5
1600130SITE4S6C.rw5
1600130SITE4S6D.rw5
1600130SITE4S6E.rw5
1600130SITE4S6F.rw5
1600130SITE4S6G.rw5
1600130SITE4S6H.rw5