

CONTROL REPORT

D214386

New York State Thruway Authority

Design Phase I-IV, Replacement of 8 Syracuse Division Bridges
Exit 35 Ramp Bridge over Mainline (BIN 5510090)
Mile Post 278.93 in the Syracuse Division
Onondaga 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



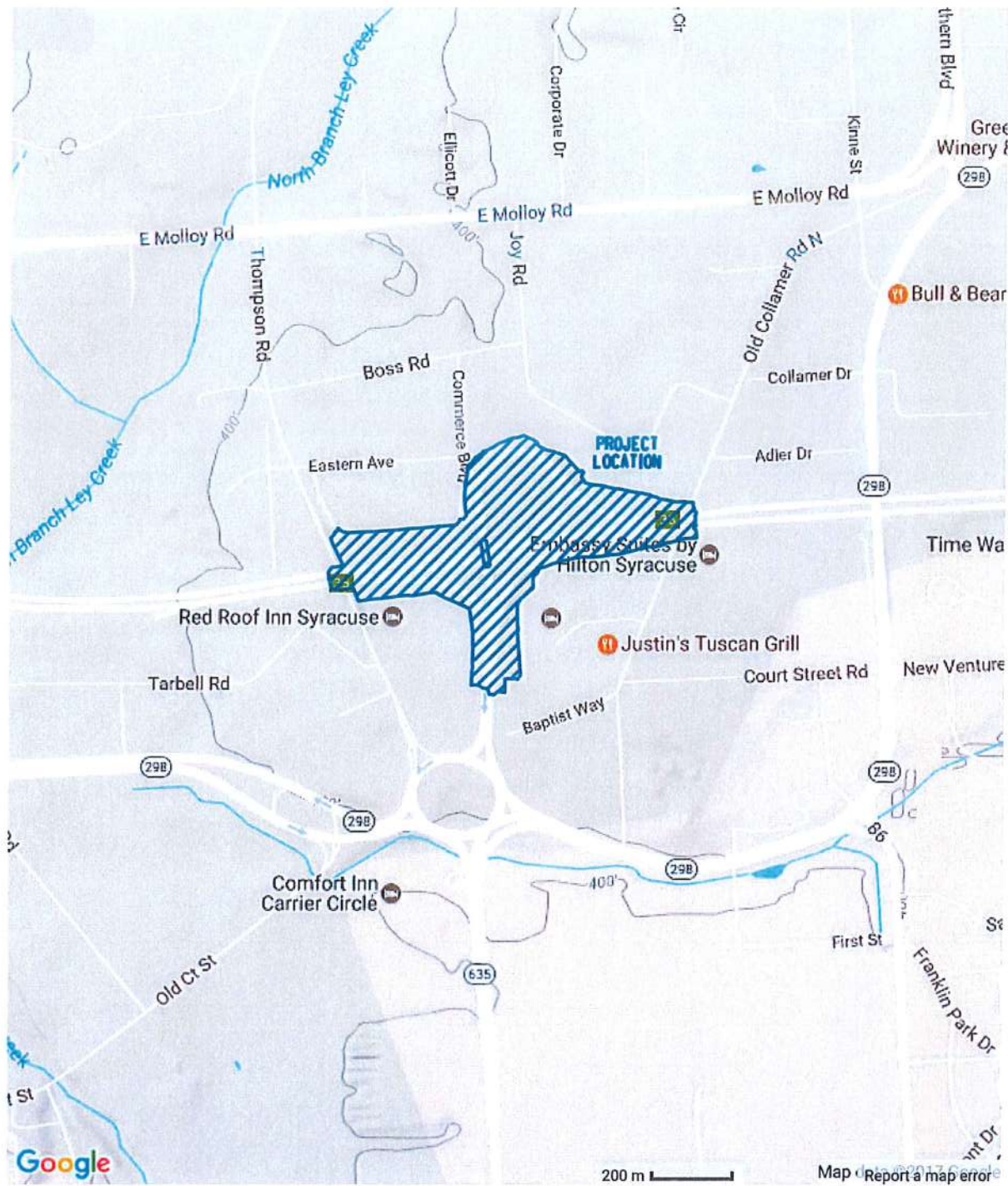
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INTRODUCTION

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
Exit 35 Ramp Bridge over Mainline (BIN 5510090)
Mile Post 278.93 in the Syracuse Division
Onondaga County

PROJECT NARRATIVE

This project involves providing preliminary design services to address corridor needs along and underneath Interstate 90, at MP 278.93 Exit 35 Ramp 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 January 13, 2017 to February 3, 2017. 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, Joshua Kohut, 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
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Onondaga 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 3 – CBP 4 and CBP 9 – CBP 10 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 3 – CBP 4. The traverse then proceeded in a westerly direction establishing CBP 5 – CBP 8 and CBP 11, then closing on the Primary GPS pair CBP 1 – CBP 2. Spur points CBS 1B, 1C, 1D, 11B and 11C were also set at the site to obtain topographic information. Using the formula $4.5 \times \sqrt{N}$ where 4.5 is seconds of arc and N is the number of traverse segments, the first traverse had an allowable angular misclosure of 11.02" and had an actual angular misclosure of 10.54".

The second traverse was also a closed leg traverse that began by occupying the Primary GPS pair CBP 9 – CBP 10, the traverse then proceeded in an easterly direction continuing through CBP 12 and then closing on a leg of the first traverse CBP 11 – CBP 1. Using the formula $4.5 \times \sqrt{N}$ 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 0.97".

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 0.99994202 was used.

Existing Control:

N/A

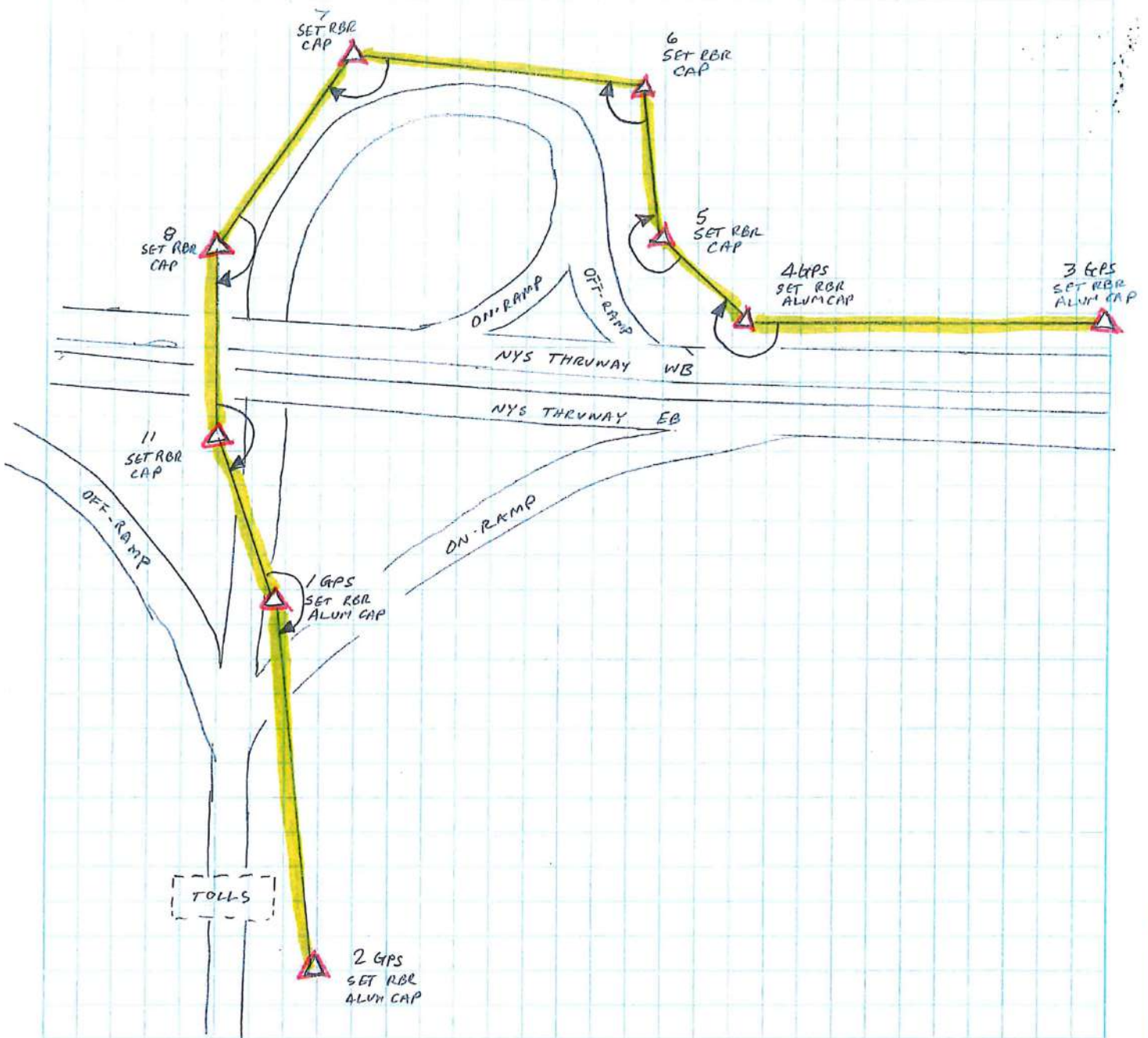
Traverse Closure and Adjustment:

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.

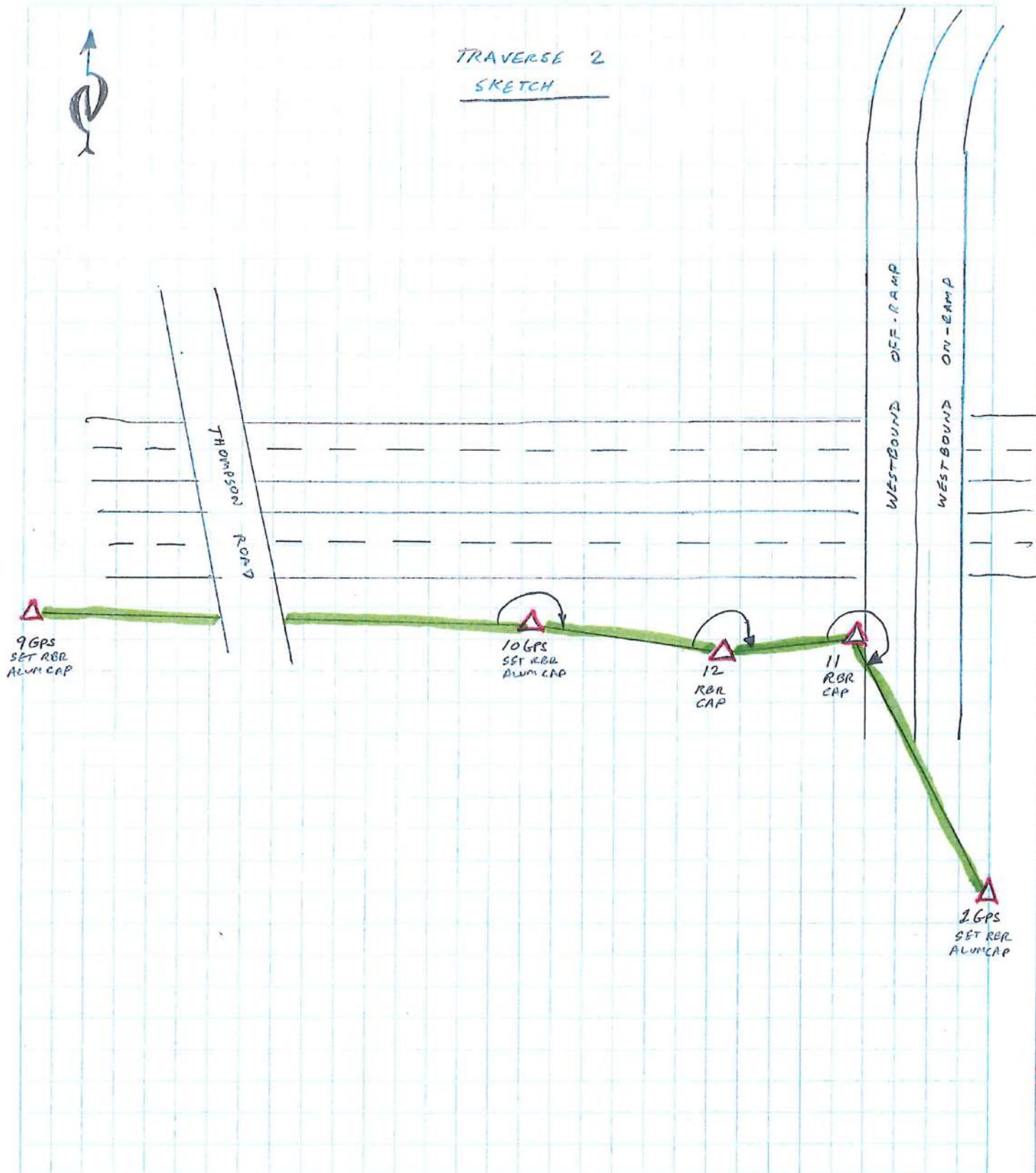
	<u>Raw Closure</u>	<u>Closure After Angle Balance</u>
Traverse 1	1 in 66755	1 in 152324
Traverse 2	1 in 20007	1 in 20154

TRAVERSE SKETCH

TRAVERSE 1
SKETCH



TRAVERSE 2
SKETCH



LIST OF BASELINE COORDINATES

Survey Fieldbook Coordinate List Report

Report Created: 2/21/2017
Time: 8:28am

Fieldbook: 1600130 Site 5

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	1126991.4730	952158.9421	431.600	CBP	REBAR ALUMINUM CAP	ML-1 STA 21+53.08
1B	1126532.7140	952157.7898	426.366	CBS	MAG NAIL	
1C	1126226.0917	952146.8476	420.562	CBS	REBAR AND CAP	
1D	1127401.8326	952158.7141	425.330	CBS	REBAR AND CAP	
2GPS	1125838.3979	952155.5136	414.802	CBP	REBAR ALUMINUM CAP	ML-1 STA 10+00.00
3GPS	1127707.4099	954500.5155	414.930	CBP	REBAR ALUMINUM CAP	ML-1 STA 57+57.45
4GPS	1127626.3831	953350.1503	418.602	CBP	REBAR ALUMINUM CAP	ML-1 STA 46+04.23
5	1127595.5955	953009.9533	423.231	CBP	REBAR WITH CAP	ML-1 STA 42+62.65
6	1127972.0890	952544.9805	422.262	CBP	REBAR WITH CAP	ML-1 STA 36+64.36
7	1127981.6368	952064.0323	423.726	CBP	REBAR WITH CAP	ML-1 STA 31+83.32
8	1127405.7843	952005.9962	438.935	CBP	REBAR WITH CAP	ML-1 STA 26+04.55
9GPS	1126945.1181	950522.1442	411.129	CBP	REBAR ALUMINUM CAP	ML-2 STA 10+00.00
10GPS	1127123.4478	951635.6426	420.527	CBP	REBAR ALUMINUM CAP	ML-2 STA 21+27.69
11	1127160.4840	952046.8908	439.197	CBP	REBAR WITH CAP	ML-1 STA 23+55.86 ML-2 STA 25+41.53
11B	1127189.7594	951878.0532	419.450	CBS	REBAR WITH CAP	
11C	1126599.7798	952018.6812	423.890	CBS	REBAR WITH CAP	
12	1127131.1013	951873.5805	422.580	CBP	REBAR WITH CAP	ML-2 STA 23+65.75

CONTROL POINT TIE SHEETS

FOIT-ALBERT ASSOCIATES CONTROL SURVEY DATA

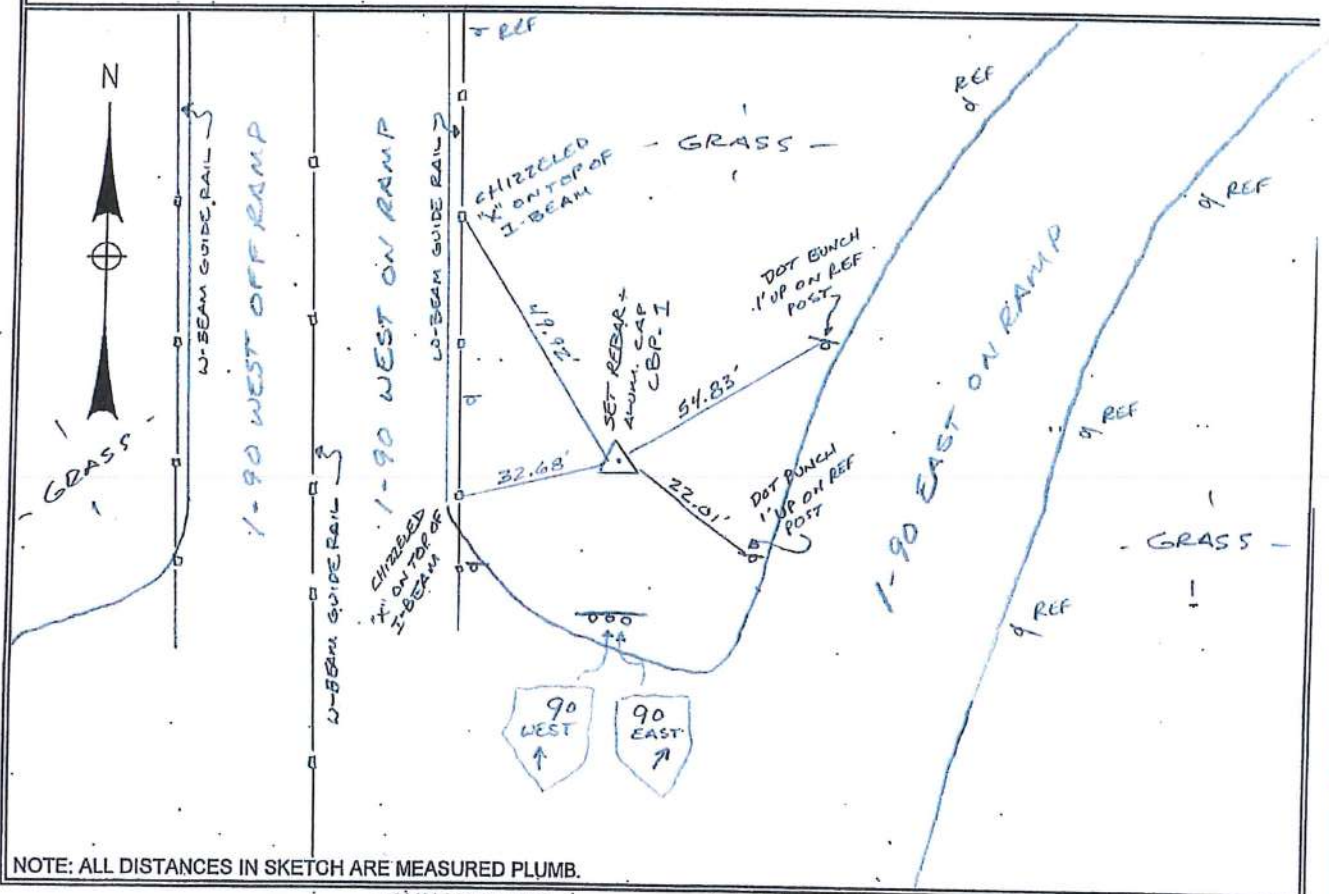
PROJECT - 16001.30 SITES
P.I.N. _____

PROJECTION NY CENTRAL
ZONE, 3102

ORDER OF SURVEY: _____
STATE PLANE COORDINATE SYSTEM

CITY OR TOWN, COUNTY	NAME OF STATION	YEAR
SYRACUSE, ONONDAGA	CP No. <u>CBP 1</u>	<u>2017</u>
N(Y) = <u>1126991.4730</u> (GRID)	DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS OBSERVED AT STATION	
E(X) = <u>952158.9421</u> (GRID)	OBJECT	GRID DISTANCE (METER)
VERTICAL DATUM: <u>NAVD 88</u>		GRID BEARING
ELEVATION (METER): <u>431.600</u>		
COMBINED FACTOR <u>0.99994202</u>		
ESTABLISHED BY: <u>NAM</u> YEAR <u>2017</u>		
FOIT-ALBERT ASSOCIATES		

DESCRIPTION: SET RBR + ALUM. CAP IN GRASS AREA 500' + OR - NORTH OF TOLL BOOTHS BETWEEN I-90 EAST AND I-90 WEST ON RAMP.



CHECKED BY: _____ DATE: _____

FOIT-ALBERT ASSOCIATES CONTROL SURVEY DATA

PROJECT - 16001.30 SITE 5

P.I.N. _____

PROJECTION NY CENTRAL

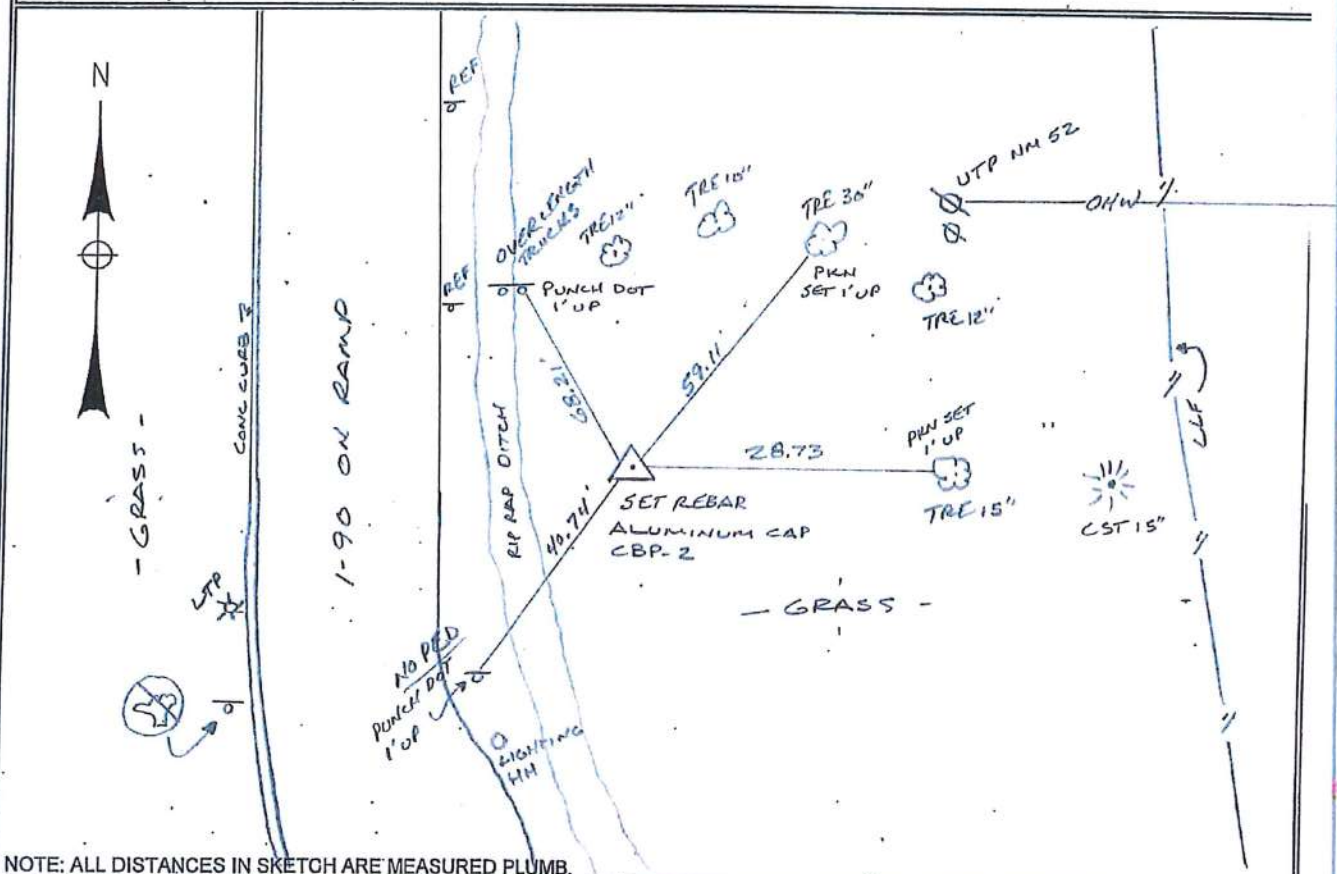
ZONE, 3102

ORDER OF SURVEY: _____

STATE PLANE COORDINATE SYSTEM

CITY OR TOWN, COUNTY	NAME OF STATION	YEAR
SYRACUSE, ONONDAGA	CP No. CBP-2	2017
DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS OBSERVED AT STATION		
N(Y) = <u>1125838.3979</u> (GRID)	OBJECT	GRID DISTANCE (METER)
E(X) = <u>952155.4571</u> (GRID)		GRID BEARING
VERTICAL DATUM: <u>NAVD. 88</u>		
ELEVATION (METER): <u>414.801</u>		
COMBINED FACTOR <u>0.99994202</u>		
ESTABLISHED BY: <u>MM</u> YEAR <u>2017</u>		
FOIT-ALBERT ASSOCIATES		

DESCRIPTION: SET REBAR+ALUM. CAP 500'+ OR- SOUTH OF TOLL BOOTH IN GRASS AREA EAST SIDE OF I-90 ON AND OFF RAMP



CHECKED BY: _____

DATE: _____

FOIT-ALBERT ASSOCIATES CONTROL SURVEY DATA

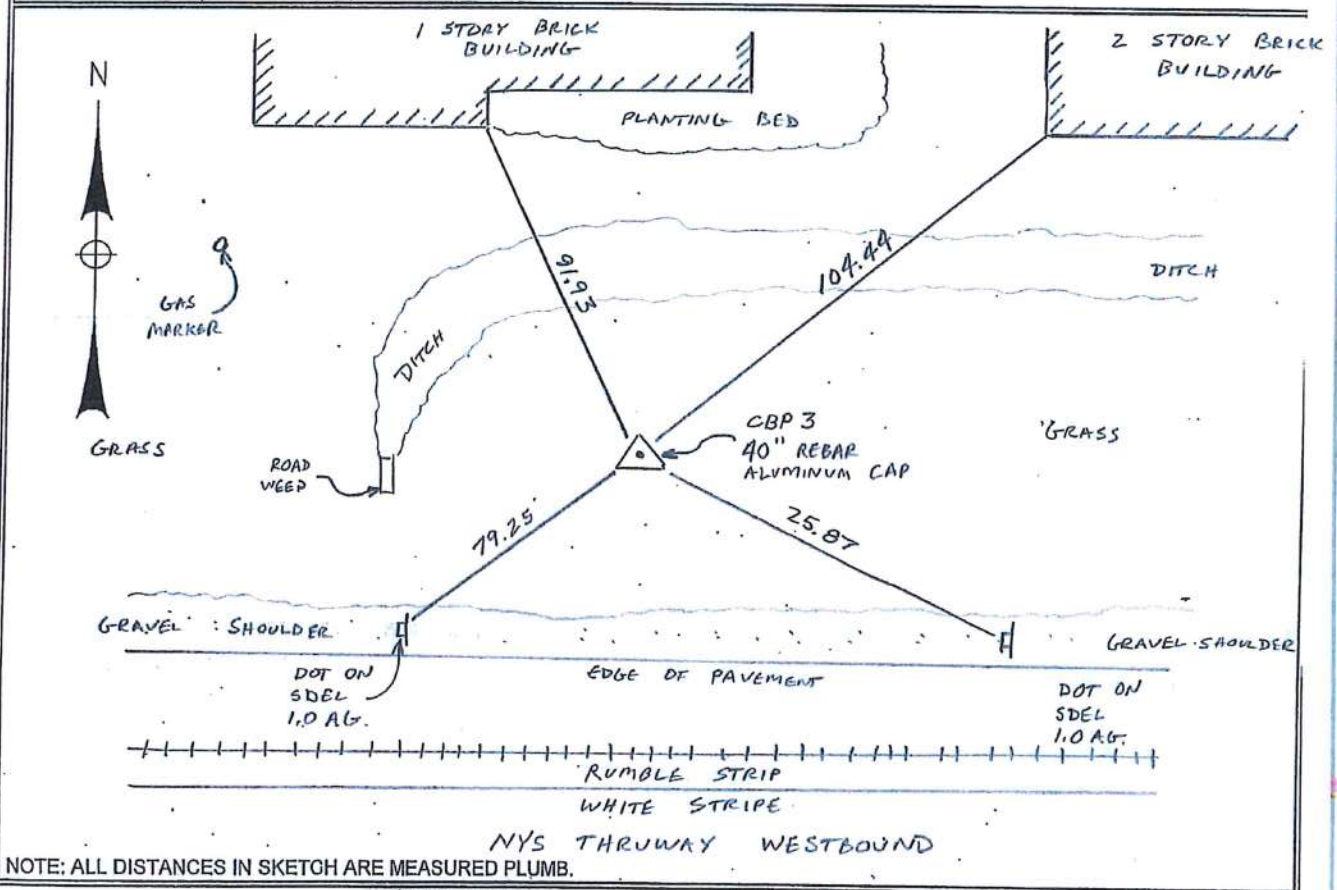
PROJECT - 16001.30 SITE 5
P.I.N. _____

PROJECTION NY CENTRAL
ZONE, 3102

ORDER OF SURVEY: _____
STATE PLANE COORDINATE SYSTEM

CITY OR TOWN, COUNTY	NAME OF STATION	YEAR
SYRACUSE, ONONDAGA	CP No. CBP 3	2017
N(Y) = <u>1127707.4099</u> (GRID)	DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS OBSERVED AT STATION	
E(X) = <u>954500.5155</u> (GRID)	OBJECT	GRID DISTANCE (METER)
VERTICAL DATUM: <u>NAVD 88</u>		GRID BEARING
ELEVATION (METER): <u>414.930</u>		
COMBINED FACTOR <u>0.99994202</u>		
ESTABLISHED BY: <u>JS</u> YEAR <u>2017</u>		
FOIT-ALBERT ASSOCIATES		

DESCRIPTION: SET REBAR AND ALUMINUM CAP IN SHOULDER OF THRUWAY WESTBOUND, 450'± WEST OF THE WESTERN FACE OF KINNE ST BRIDGE, 15'± NORTH OF NYS THRUWAY EDGE OF PAVEMENT.



CHECKED BY: _____ DATE: _____

FOIT-ALBERT ASSOCIATES CONTROL SURVEY DATA

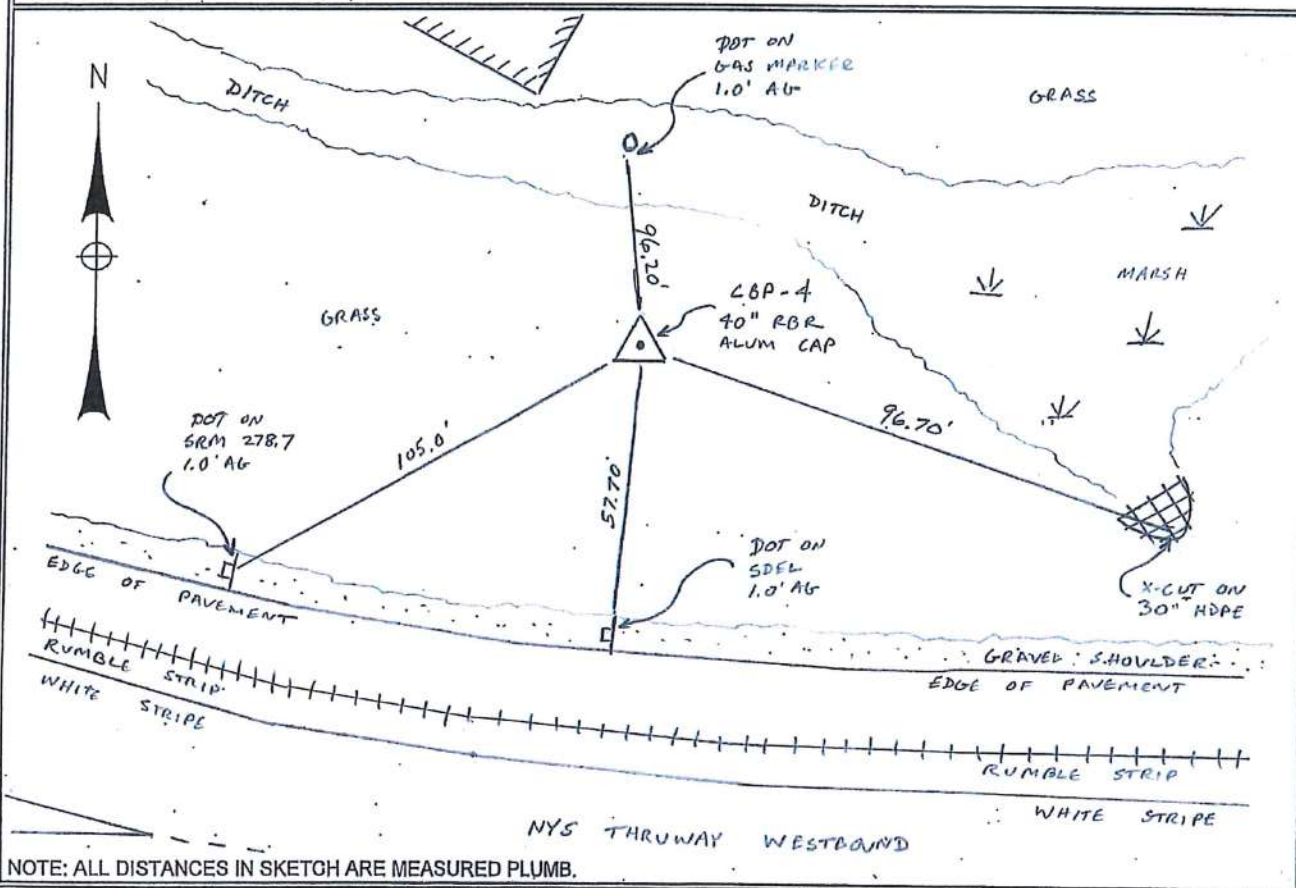
PROJECT - 16001.30 SITE 5
P.I.N. _____

PROJECTION NY CENTRAL
ZONE, 3102

ORDER OF SURVEY: _____
STATE PLANE COORDINATE SYSTEM

CITY OR TOWN, COUNTY	NAME OF STATION	YEAR
SYRACUSE, ONONDAGA	CP No. <u>CBP-4</u>	2017
N(Y) = <u>1127626.3831</u> (GRID)	DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS OBSERVED AT STATION	
E(X) = <u>953350.1503</u> (GRID)	OBJECT	GRID DISTANCE (METER)
VERTICAL DATUM: <u>NAVD 88</u>		GRID BEARING
ELEVATION (METER): <u>418.601</u>		
COMBINED FACTOR <u>0.99994202</u>		
ESTABLISHED BY: <u>J.S. YEAR 2017</u>		
FOIT-ALBERT ASSOCIATES		

DESCRIPTION: SET REBAR AND ALUMINUM CAP IN SHOULDER OF THRUWAY WESTBOUND, 700'± WEST OF A FOUR-POST SIGN FOR SYRACUSE EAST SYRACUSE, 57'± NORTH OF EXIT 35 EDGE OF PAVEMENT.



CHECKED BY: _____ DATE: _____

FOIT-ALBERT ASSOCIATES CONTROL SURVEY DATA

PROJECT - 16001.30 SITE 5

P.I.N. _____

PROJECTION NY CENTRAL

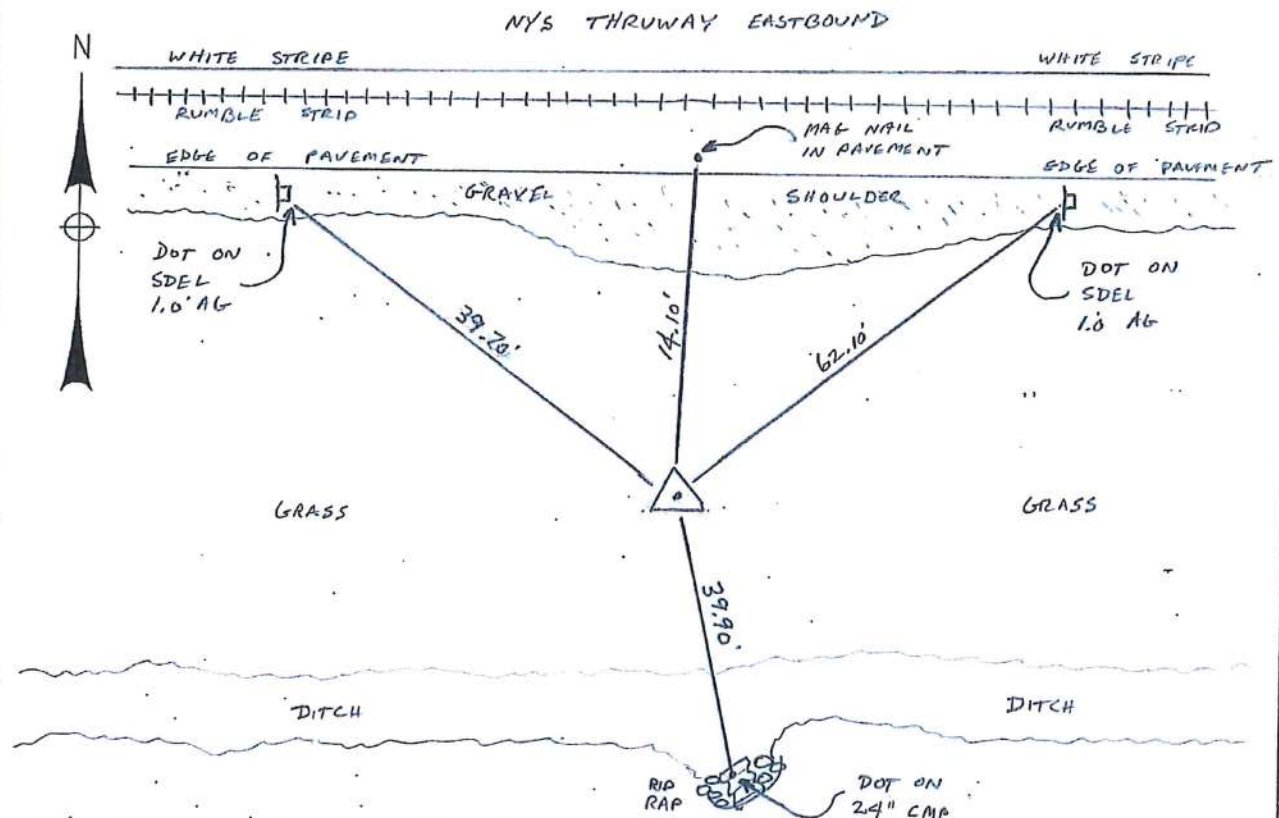
ZONE, 3102

ORDER OF SURVEY: _____

STATE PLANE COORDINATE SYSTEM

CITY OR TOWN, COUNTY	NAME OF STATION	YEAR
SYRACUSE, ONONDAGA	CP No. CBP - 9	2017
N(Y) = 1126945.1181 (GRID)	DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS OBSERVED AT STATION	
E(X) = 950522.1442 (GRID)	OBJECT	GRID DISTANCE (METER)
VERTICAL DATUM: NAVD 88		GRID BEARING
ELEVATION (METER): 411.1294		
COMBINED FACTOR 0.99994202		
ESTABLISHED BY: JS YEAR 2017		
FOIT-ALBERT ASSOCIATES		

DESCRIPTION: SET REBAR AND ALUMINUM CAP IN THE SHOULDER OF THRUWAY EASTBOUND, 210'± WEST OF A FOUR-POST SIGN FOR SYRACUSE EAST SYRACUSE, 15'± SOUTH OF THRUWAY EDGE OF PAVEMENT



NOTE: ALL DISTANCES IN SKETCH ARE MEASURED PLUMB.

CHECKED BY: _____

DATE: _____

FOIT-ALBERT ASSOCIATES CONTROL SURVEY DATA

PROJECT - 16001.30 SITE 5

P.I.N. _____

PROJECTION NY CENTRAL

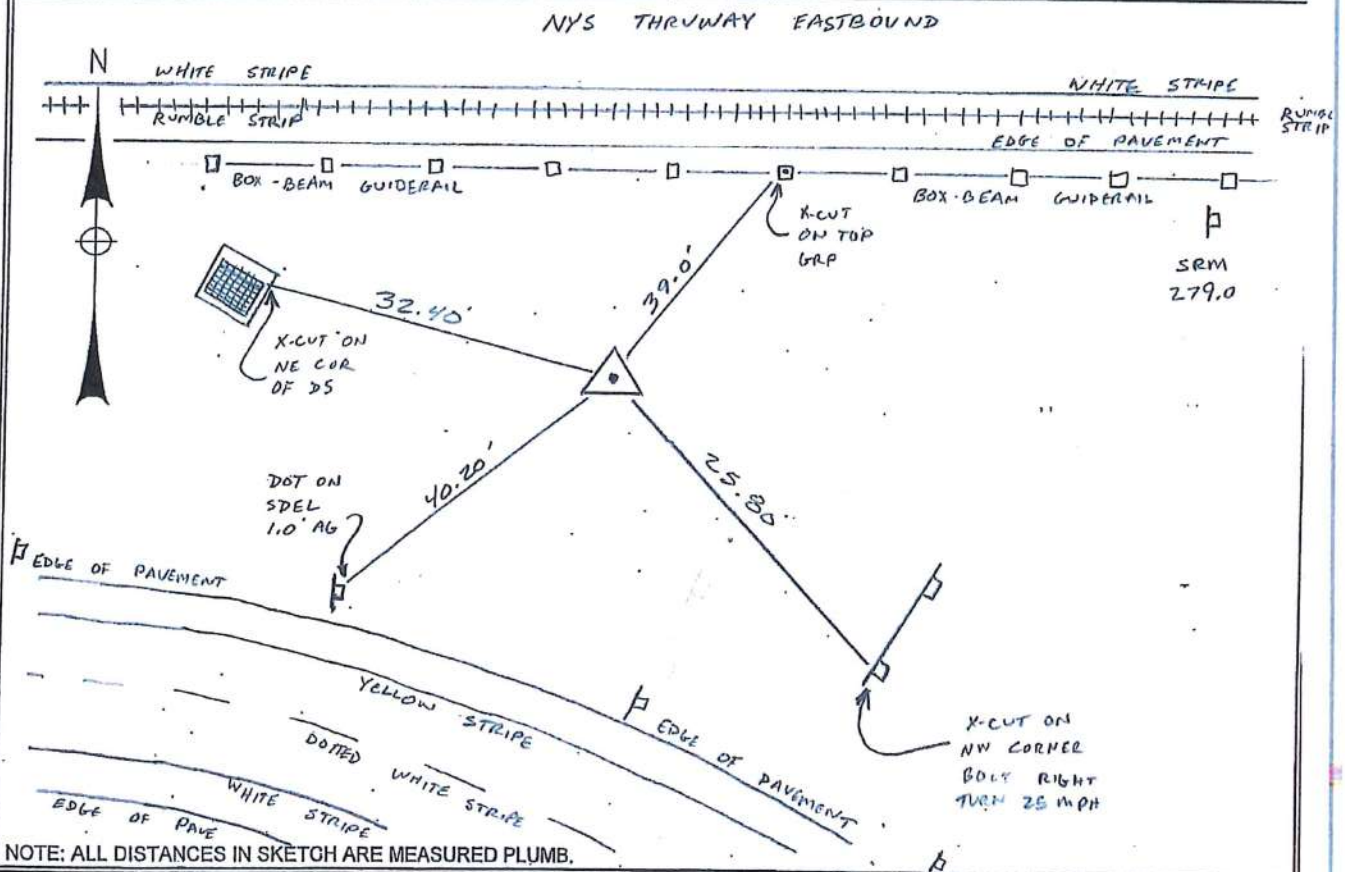
ORDER OF SURVEY: _____

ZONE, 3102

STATE PLANE COORDINATE SYSTEM

CITY OR TOWN, COUNTY	NAME OF STATION	YEAR
SYRACUSE, ONONDAGA	CP No. CBP-10	2016
N(Y) = 1127123.4478 (GRID)	DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS OBSERVED AT STATION	
E(X) = 951635.6426 (GRID)	OBJECT	GRID DISTANCE (METER)
VERTICAL DATUM: NAVD88		GRID BEARING
ELEVATION (METER): 420.526		
COMBINED FACTOR		
ESTABLISHED BY: JS YEAR 2016		
FOIT-ALBERT ASSOCIATES		

DESCRIPTION: SET REBAR AND ALUMINUM CAP IN GORE OF NYS THRUWAY EASTBOUND AND EXIT 35 OFF-RAMP, 31' EAST OF A DRAINAGE STRUCTURE, 15' NORTH OF OFF-RAMP NORTH EDGE OF PAVEMENT.



CHECKED BY: _____

DATE: _____

TRAVERSE COMPUTATIONS

TRAVERSE 1

Process No Adjust Results

Mon Mar 13 11:30:29 2017

Raw File: I:\2016\16001.00 Engineering Survey\16001.30 NYSTA - Four Bridges\Drawings\Surv\Field Files\Site 5\1600130SITE5RTR_edited.rw5

Coordinate File: C:\Users\jsmith\Desktop\SITE 5 TEST.crd

Scale Factor: 0.99994202

Correct for Earth Curvature: OFF

Closure Results

Starting Point 4GPS: N 1127626.3831 E 953350.1503 Z 418.6017

Closing Reference Point 1GPS: N 1126991.4730 E 952158.9421 Z 431.6001

Ending Point 1: N 1126991.5029 E 952158.9208 Z 431.6442

Azimuth Of Error: 324°28'34"

North Error : 0.02988

East Error : -0.02134

Vertical Error : 0.04412

Hz Dist Error : 0.03672

Sl Dist Error : 0.05740

Traverse Lines : 6

SideShots : 10

Store Points : 4

Horiz Dist Traversed: 2451.1525

Slope Dist Traversed: 2451.5034

Closure Precision: 1 in 66754.9

Starting Point 4GPS: N 1127626.3831 E 953350.1503 Z 418.6017

Backsight Point 3GPS: N 1127707.4099 E 954500.5155 Z 414.9302

Point No.	Horizontal Angle	Zenith Angle	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
5	AR178.5131	89.1738	341.6390	5.340	4.900	1127595.599	953009.9503	423.2516
CBP ,RBR CAP								
6	AR224.1005	90.0459	598.3300	5.190	5.290	1127972.100	952544.9723	422.2838
CBP ,RBR CAP								
7	AR142.0825	89.5555	481.0740	5.610	4.690	1127981.654	952064.0200	423.7760
CBP ,RBR CAP								
8	AR94.3703	88.3023	578.9920	5.020	4.910	1127405.808	952005.9788	438.9782
CBP ,RBR CAP								
11	AR164.4640	90.0116	248.7010	5.200	4.860	1127160.510	952046.8810	439.2270
CBP ,RBR CAP								
1	AR155.5531	92.0143	202.9130	5.130	5.530	1126991.502	952158.9208	431.6442
CBP ,RBR ALUM CAP								

Process Angle Balance Results

Mon Mar 13 11:31:05 2017

Raw File: I:\2016\16001.00 Engineering Survey\16001.30 NYSTA - Four Bridges\Drawings\Surv\Field Files\Site 5\1600130SITE5RTR_edited.rw5

Coordinate File: C:\Users\jsmith\Desktop\SITE 5 TEST.crd

Scale Factor: 0.99994202

Correct for Earth Curvature: OFF

Closure Results (Before Angle Balance)

Starting Point 4GPS: N 1127626.3831 E 953350.1503 Z 418.6017

Closing Reference Point 1GPS: N 1126991.4730 E 952158.9421 Z 431.6001

Ending Point 1: N 1126991.5029 E 952158.9208 Z 431.6442

Azimuth Of Error: 324°28'34"

North Error : 0.02988

East Error : -0.02134

Vertical Error : 0.04412

Hx Dist Error : 0.03672

Sl Dist Error : 0.05740

Traverse Lines : 6

SideShots : 10

Store Points : 4

Horiz Dist Traversed: 2451.1525

Slope Dist Traversed: 2451.5034

Closure Precision: 1 in 66754.9

Starting Point 4GPS: N 1127626.3831 E 953350.1503 Z 418.6017

Backsight Point 3GPS: N 1127707.4099 E 954500.5155 Z 414.9302

Point No.	Horizontal Angle	Zenith Angle	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
5	AR178.5131	89.1738	341.6390	5.340	4.900	1127595.599	953009.9503	423.2516
CBP ,RBR CAP								
6	AR224.1005	90.0459	598.3300	5.190	5.290	1127972.100	952544.9723	422.2838
CBP ,RBR CAP								
7	AR142.0825	89.5555	481.0740	5.610	4.690	1127981.654	952064.0200	423.7760
CBP ,RBR CAP								
8	AR94.3703	88.3023	578.9920	5.020	4.910	1127405.808	952005.9788	438.9782
CBP ,RBR CAP								
11	AR164.4640	90.0116	248.7010	5.200	4.860	1127160.510	952046.8810	439.2270
CBP ,RBR CAP								
1	AR155.5531	92.0143	202.9130	5.130	5.530	1126991.502	952158.9208	431.6442
CBP ,RBR ALUM CAP								

Angle Balance

Angular Error: 0°00'10.54" for 7 traverse sides

Adjusting Each Angle: 0°00'01.51"

Closure Results (After Angle Balance)

Starting Coordinates : N 1127626.3831 E 953350.1503 Z 418.6017

Closing Reference Point 1GPS: N 1126991.4730 E 952158.9421 Z 431.6001

Ending Coordinates : N 1126991.4878 E 952158.9485 Z 431.6442

Azimuth Of Error: 23°18'23"

North Error : 0.01478

East Error : 0.00637

Vertical Error : 0.04412

Hx Dist Error : 0.01609

Sl Dist Error : 0.04697

Traverse Lines : 6

SideShots

Total Hx Dist Traversed: 2451.15255

Total Sl Dist Traversed: 2451.50339

Closure Precision: 1 in 152324.4

Point No.	Horizontal Angle	Zenith Angle	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
5	AR178.5129	89.1738	341.6390	5.340	4.900	1127595.597	953009.9505	423.2516
CBP ,RBR CAP								
6	AR224.1004	90.0459	598.3300	5.190	5.290	1127972.091	952544.9671	422.2838
CBP ,RBR CAP								
7	AR142.0823	89.5555	481.0740	5.610	4.690	1127981.634	952064.0145	423.7760
CBP ,RBR CAP								
8	AR94.3702	88.3023	578.9920	5.020	4.910	1127405.787	952005.9902	438.9782
CBP ,RBR CAP								
11	AR164.4638	90.0116	248.7010	5.200	4.860	1127160.490	952046.9013	439.2270
CBP ,RBR CAP								
1	AR155.5529	92.0143	202.9130	5.130	5.530	1126991.487	952158.9485	431.6442
CBP ,RBR ALUM CAP								

Process Compass Results

Mon Mar 13 11:31:26 2017

Raw File: I:\2016\16001.00 Engineering Survey\16001.30 NYSTA - Four Bridges\Drawings\Surv\Field Files\Site 5\1600130SITE5RTR_edited.rw5

Coordinate File: C:\Users\jsmith\Desktop\SITE 5 TEST.crd

Scale Factor: 0.99994202

Correct for Earth Curvature: OFF

Backsight Point 3GPS: N 1127707.4099 E 954500.5155 Z 414.9302

Adjusted Elevation Comparison

Point#	Original Z	Adjusted Z	Delta Z
5	423.252	423.245	-0.006
6	422.284	422.267	-0.017
7	423.776	423.750	-0.026
8	438.978	438.942	-0.036
11	439.227	439.186	-0.040
1	431.644	431.600	-0.044

Compass Closure

Adjusted Point Comparison

Point#	Original		Adjusted		Dist	Bearing
	Northing	Easting	Northing	Easting		
5	1127595.600	953009.950	1127595.595	953009.953	0.005	S 35°31'26" E
6	1127972.100	952544.972	1127972.089	952544.981	0.014	S 35°31'26" E
7	1127981.654	952064.020	1127981.637	952064.032	0.021	S 35°31'26" E
8	1127405.809	952005.979	1127405.784	952005.996	0.030	S 35°31'26" E
11	1127160.510	952046.881	1127160.483	952046.901	0.034	S 35°31'26" E
1	1126991.503	952158.921	1126991.473	952158.942	0.037	S 35°31'26" E

Max adjustment: 0.037

Point No.	Horizontal Angle	Zenith Angle	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
5	AR178.5128	89.1738	341.6132	5.340	4.900	1127595.595	953009.9533	423.2455
CBP ,RBR CAP								
6	AR224.1007	90.0459	598.2874	5.190	5.290	1127972.089	952544.9805	422.2669
CBP ,RBR CAP								
7	AR142.0823	89.5555	481.0433	5.610	4.690	1127981.636	952064.0323	423.7504
CBP ,RBR CAP								
8	AR94.3704	88.3023	578.9660	5.020	4.910	1127405.784	952005.9962	438.9422
CBP ,RBR CAP								
11	AR164.4641	90.0116	248.6884	5.200	4.860	1127160.483	952046.9005	439.1865
CBP ,RBR CAP								
1	AR155.5532	92.0143	202.9022	5.130	5.530	1126991.473	952158.9421	431.6001
CBP ,RBR ALUM CAP								

TRAVERSE 2

File: I:\2016\16001.00 Engineering Survey\16001.30 NYSTA - Four Bridges\Drawings\Surv\Reports\Site 5\Trav 2
! No adjust_revised.txt 3/15/2017, 3:22:50 PM

Process No Adjust Results

Mon Mar 13 11:32:08 2017

Raw File: I:\2016\16001.00 Engineering Survey\16001.30 NYSTA - Four Bridges\Drawings\Surv\Field Files\Site 5\1600130SITE5TRV2_edited(Final).rw5

Coordinate File: C:\Users\jsmith\Desktop\SITE 5 TEST.crd

Scale Factor: 0.99994202

Correct for Earth Curvature: OFF

Closure Results

Starting Point 10GPS: N 1127123.4478 E 951635.6426 Z 420.5267

Closing Reference Point 11: N 1127160.4840 E 952046.8908 Z 439.1977

Ending Point 11A: N 1127160.4779 E 952046.8710 Z 439.1761

Azimuth Of Error: 252°51'49"

North Error : -0.00609

East Error : -0.01977

Vertical Error : -0.02157

Hz Dist Error : 0.02068

Sl Dist Error : 0.02989

Traverse Lines : 2

SideShots : 2

Store Points : 4

Horiz Dist Traversed: 413.8242

Slope Dist Traversed: 414.6014

Closure Precision: 1 in 20007.0

Starting Point 10GPS: N 1127123.4478 E 951635.6426 Z 420.5267

Backsight Point 9GPS: N 1126945.1181 E 950522.1442 Z 411.1294

Point No. Description	Horizontal Angle	Zenith Angle	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
12	AR187.1526	89.2911	238.0736	5.090	5.180	1127131.097	951873.5692	422.5708
CBP ,RBR CAP								
11A	AR172.1311	84.3918	176.5510	5.360	5.200	1127160.477	952046.8710	439.1761
CBP 11								

Process Angle Balance Results

Mon Mar 13 11:32:31 2017

Raw File: I:\2016\16001.00 Engineering Survey\16001.30 NYSTA - Four Bridges\Drawings\Surv\Field Files\Site 5\1600130SITE5TRV2_edited(Final).rw5

Coordinate File: C:\Users\jsmith\Desktop\SITE 5 TEST.crd

Scale Factor: 0.99994202

Correct for Earth Curvature: OFF

Closure Results (Before Angle Balance)

Starting Point 10GPS: N 1127123.4478 E 951635.6426 Z 420.5267

Closing Reference Point 11: N 1127160.4840 E 952046.8908 Z 439.1977

Ending Point 11A: N 1127160.4779 E 952046.8710 Z 439.1761

Azimuth Of Error: 252°51'49"

North Error : -0.00609

East Error : -0.01977

Vertical Error : -0.02157

Hz Dist Error : 0.02068

Sl Dist Error : 0.02989

Traverse Lines : 2

SideShots : 2

Store Points : 4

Horiz Dist Traversed: 413.8242

Slope Dist Traversed: 414.6014

Closure Precision: 1 in 20007.0

Starting Point 10GPS: N 1127123.4478 E 951635.6426 Z 420.5267

Backsight Point 9GPS: N 1126945.1181 E 950522.1442 Z 411.1294

Point No.	Horizontal Angle	Zenith Angle	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
12	AR187.1526	89.2911	238.0736	5.090	5.180	1127131.097	951873.5692	422.5708
CBP ,RBR CAP								
11A	AR172.1311	84.3918	176.5510	5.360	5.200	1127160.477	952046.8710	439.1761
CBP 11								

Angle Balance

Angular Error: 0°00'00.97" for 3 traverse sides

Adjusting Each Angle: 0°00'00.32"

Closure Results (After Angle Balance)

Starting Coordinates : N 1127123.4478 E 951635.6426 Z 420.5267

Closing Reference Point 11: N 1127160.4840 E 952046.8908 Z 439.1977

Ending Coordinates : N 1127160.4788 E 952046.8709 Z 439.1761

Azimuth Of Error: 255°24'10"

North Error : -0.00517

East Error : -0.01987

Vertical Error : -0.02157

Hz Dist Error : 0.02053

Sl Dist Error : 0.02978

Traverse Lines : 2

SideShots

Total Hz Dist Traversed: 413.82417

Total Sl Dist Traversed: 414.60137

Closure Precision: 1 in 20154.2

Point No.	Horizontal Angle	Zenith Angle	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
12	AR187.1526	89.2911	238.0736	5.090	5.180	1127131.098	951873.5692	422.5708

CBP ,RBR CAP

11A AR172.1310 84.3918 176.5510 5.360 5.200 1127160.478 952046.8709 439.1761

CBP 11

Process Compass Results

Mon Mar 13 11:32:53 2017

Raw File: I:\2016\16001.00 Engineering Survey\16001.30 NYSTA - Four Bridges\Drawings\Surv\Field Files\Site 5\1600130SITE5TRV2_edited(Final).rw5

Coordinate File: C:\Users\jsmith\Desktop\SITE 5 TEST.crd

Scale Factor: 0.99994202

Correct for Earth Curvature: OFF

Backsight Point 9GPS: N 1126945.1181 E 950522.1442 Z 411.1294

Adjusted Elevation Comparison

Point#	Original Z	Adjusted Z	Delta Z
12	422.571	422.583	0.012
11A	439.176	439.198	0.022

Compass Closure

Adjusted Point Comparison

Point#	Original		Adjusted		Dist	Bearing
	Northing	Easting	Northing	Easting		
12	1127131.098	951873.569	1127131.101	951873.581	0.012	N 72°51'49" E
11A	1127160.478	952046.871	1127160.484	952046.891	0.021	N 72°51'49" E

Max adjustment: 0.021

Point No.	Horizontal Angle	Zenith Angle	Slope Dist	Inst HT	Rod HT	Northing	Easting	Elev
12	AR187.1523	89.2911	238.0707	5.090	5.180	1127131.101	951873.5805	422.5832
CBP ,RBR CAP								
11A	AR172.1312	84.3918	176.5518	5.360	5.200	1127160.484	952046.8908	439.1977
CBP 11								

FIELD NOTES FOR TRAVERSE

FOIT-ALBERT ASSOCIATES

PROJECT 16001.30 SITE 5 P.C. JS WEATHER: 32°F CLOUDY
P.I.N. _____ CREW: INST. JK
DATE 1-24-17 ROD 5C SHEET: 1 OF 2

V+H COLL.
DONE ☒

RAW DATA FILE: 1600130 SITE 5 TR (TRAVERSE 1)
CONTROL FILE: _____
START POINT: _____

POINT NO.	COMMENT
	<u>56 SURVEY</u>
T: 32°F P: 29.67"	<div> <u>T @ CBP 4</u> <u>HI: 5.34</u> <u>ΔH: -0.057</u> </div> <div> <u>BS @ CBP 3</u> <u>HT: 4.93</u> <u>ΔV: -0.0291</u> </div>
CBP 5	FS HT: 4.90
T: 32°F P: 29.68"	<div> <u>T @ CBP 5</u> <u>HI: 5.19</u> <u>ΔH: -0.0065</u> </div> <div> <u>BS @ CBP 4</u> <u>HT: 5.28</u> <u>ΔV: -0.0289</u> </div>
CBP 6	FS HT: 5.29
T: 32°F P: 29.47"	<div> <u>T @ CBP 6</u> <u>HI: 5.61</u> <u>ΔH: -0.0022</u> </div> <div> <u>BS @ CBP 5</u> <u>HT: 5.13</u> <u>ΔV: -0.0365</u> </div>
CBP 7	FS HT: 4.69
T: 32°F P: 29.67"	<div> <u>T @ CBP 7</u> <u>HI: 5.02</u> <u>ΔH: -0.0076</u> </div> <div> <u>BS @ CBP 6</u> <u>HT: 5.635</u> <u>ΔV: -0.0607</u> </div>
CBP 8	FS HT: 4.91
T: 32°F P: 29.67"	<div> <u>T @ CBP 8</u> <u>HI: 5.20</u> <u>ΔH: 0.0037</u> </div> <div> <u>BS @ CBP 7</u> <u>HT: 4.945</u> <u>ΔV: -0.0374</u> </div>

CBP 11

FS HT: 4.86

FOIT-ALBERT ASSOCIATES

PROJECT 16001.30 SITE 5

P.C. JS

WEATHER: 32°F CLOUDY

P.I.N. _____

CREW: INST. JK

DATE 1-24-17

ROD JC

SHEET: 2 OF 2

RAW DATA FILE: 1600130SITESTR (TRAVERSE 1)

CONTROL FILE: _____

START POINT: _____

POINT NO.	COMMENT
	<u>50 SURVEY</u>
T: 33°F	T @ CBP 11
P: 29.68"	HT: 5.13
	ΔH: -0.0119
1GPS	FS HT = 4.55 5.53
T: 33°F	T @ CBP 1 (1GPS)
P: 29.68"	HT: 5.19
	ΔH: -0.0174
2GPS	FS HT = 5.470
	B5 @ CBP 8
	HT: 5.14
	ΔH: 0.0262
	B5 @ CBP 11
	HT: 5.06
	ΔH: -0.0322

FOIT-ALBERT ASSOCIATES

PROJECT 16001.30

P.C. MM

WEATHER: 35° SUN

P.I.N. _____

CREW: INST. JK

DATE 2-8-17

ROD _____

SHEET: 1 OF 10

V+H COLL.

DONE ✓

TEMP: 36°

PRESSURE: 29.78"

RAW DATA FILE: 1600130SITE5RF

(TRAVERSE 2)

CONTROL FILE: ROBOT/TRAVER

START POINT: 2311-2313

POINT NO.	COMMENT
T: 36°F P: 29.78"	TS-10 BS-(9) (HI=5.09 BS=5.05)
	FS-12 HI=5.18
T: 36°F P: 29.78"	TS-12 BS-(10) (HI=5.36 BS=4.91)
	FS-11A HI=5.20
T: 36°F P: 29.78"	TS-11A BS-(12) (HI=5.38 BS=5.19)
	FS-10A HI=5.12

VERTICAL CONTROL

D214386
New York State Thruway Authority
Design Phase I-IV, Replacement of 8 Syracuse Division Bridges
Exit 35 Ramp Bridge over Mainline (BIN 5510090)
Mile Post 278.93 in the Syracuse Division
Onondaga 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 431.600' on CBP 1 was used and applied to control points and benchmarks set around the project area. Benchmarks CPBM1 through CPBM3 were all set and leveled through using differential leveling methods.

Control Recovered:

NGS Monument P 475, PID AJ6392 a flange-encased rod recovered in good condition
Published elevation = 408.798'
Measured elevation = 408.813'

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 CPBM 2, a set L-cut on the southwest corner of a concrete bridge abutment, then continuing through CBP 2, a set rebar and aluminum cap, then continuing to close on CBP 1.

The total length of the first level run was 0.532 miles with a misclosure of +0.005 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.

The second level loop began at CBP 1, a set rebar and aluminum cap, and ran through CBP 4, a set rebar and aluminum cap, the loop continued through CPBM

1, a set X-cut on top of the southwest bolt of the southernmost post of a four-post sign, then continuing to close back on CBP 1.

The total length of the second level run was 1.219 miles with a misclosure of -0.021 ft. Using the formula $0.03 \times \text{the square root of } K$, the allowable error was ± 0.033 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 2, L-cut on top of the southwest concrete abutment wall, then ran through CBP 10, a set rebar and aluminum cap, the loop continued through CPBM 3, an X-cut on the northeast bolt of the northernmost post of a four-post sign, then continued through CBP 9, a set rebar and aluminum cap, then continuing to close back on CPBM 2.

The total length of the third level run was 0.567 miles with a misclosure of +0.010 ft. Using the formula $0.03 \times \text{the square root of } K$, the allowable error was ± 0.023 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 2, a set L-cut on the southwest concrete abutment wall, then ran through CBP 8 through CBP 5, all set rebar and caps, the level continued to close on CPBM 1, X-cut on top of the southwest bolt of the southernmost post of a four-post sign.

The total length of the fourth level run was 0.574 miles with a misclosure of -0.021 ft. Using the formula $0.03 \times \text{the square root of } K$, the allowable error was ± 0.023 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 5

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
NGS MONUMENT	1129246.1923	941143.7756	408.813	P 475 PID AJ6392	
CPBM1	1127687.6679	954051.8138	418.645	XCUT SW BOLT	ML-1 STA 53+08.47, OS 11.83 L
CPBM2	1127169.1017	952047.7875	440.314	LCUT SW BWW	ML-1 STA 23+64.21, OS 2.30 R
CPBM3	1126956.5546	950735.0982	413.959	XCUT NE BOLT	ML-2 STA 12+12.08, OS 22.38 R

HORIZONTAL CONTROL POINT ELEVATION LIST

Survey Fieldbook Coordinate List Report

Report Created: 2/21/2017
Time: 8:28am

Fieldbook: 1600130 Site 5

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	1126991.4730	952158.9421	431.600	CBP	REBAR ALUMINUM CAP	ML-1 STA 21+53.08
1B	1126532.7140	952157.7898	426.366	CBS	MAG NAIL	
1C	1126226.0917	952146.8476	420.562	CBS	REBAR AND CAP	
1D	1127401.8326	952158.7141	425.330	CBS	REBAR AND CAP	
2GPS	1125838.3979	952155.5136	414.802	CBP	REBAR ALUMINUM CAP	ML-1 STA 10+00.00
3GPS	1127707.4099	954500.5155	414.930	CBP	REBAR ALUMINUM CAP	ML-1 STA 57+57.45
4GPS	1127626.3831	953350.1503	418.602	CBP	REBAR ALUMINUM CAP	ML-1 STA 46+04.23
5	1127595.5955	953009.9533	423.231	CBP	REBAR WITH CAP	ML-1 STA 42+62.65
6	1127972.0890	952544.9805	422.262	CBP	REBAR WITH CAP	ML-1 STA 36+64.36
7	1127981.6368	952064.0323	423.726	CBP	REBAR WITH CAP	ML-1 STA 31+83.32
8	1127405.7843	952005.9962	438.935	CBP	REBAR WITH CAP	ML-1 STA 26+04.55
9GPS	1126945.1181	950522.1442	411.129	CBP	REBAR ALUMINUM CAP	ML-2 STA 10+00.00
10GPS	1127123.4478	951635.6426	420.527	CBP	REBAR ALUMINUM CAP	ML-2 STA 21+27.69
11	1127160.4840	952046.8908	439.197	CBP	REBAR WITH CAP	ML-1 STA 23+55.86 ML-2 STA 25+41.53
11B	1127189.7594	951878.0532	419.450	CBS	REBAR WITH CAP	
11C	1126599.7798	952018.6812	423.890	CBS	REBAR WITH CAP	
12	1127131.1013	951873.5805	422.580	CBP	REBAR WITH CAP	ML-2 STA 23+65.75

LEVEL LOOP NO. 1

LOOP 1

FOIT-ALBERT ASSOCIATES

PROJECT 1001.30 SITES			DATUM	UNITS	INSTRUMENT: LIECA DINA-2		DATE	WEATHER	P.C.	INST.	ROD	SHEET
P.I.N.	TURN	3 WIRE BS	BS (+)	HI	3 WIRE FS	FS (-)	ELEV.	ADJ. ELEV.	DESCRIPTION			1 OF 3
		9.920	9.580	441.802			431.6002		CBP 1 - RBE ALUM CAP		56	
	TP-1	9.580				2.720	438.4602	438.4598			67.0'	76.0'
		1.250										
		6.320	6.060	444.5202							52.0	
		6.060										
		5.800										
	TP-2				4.440	4.205	440.3152	440.3152	CBM 2 - L-CUT ON SW CONC BRIDGE ABUTMENT			47.0
					4.205							
		4.125	3.890	444.2052							47.5	
		3.890										
		3.650										
	TP-3				6.000	5.740	438.4652	438.4641				52.0
					5.740							
					5.480						64.0	
		3.485	3.160	441.6252								
		3.160										
		2.840										
	TP-4				6.701	6.380	435.2452	435.2437				65.1
					6.380							
					6.050						68.0	
		3.810	2.970	438.2152								
		2.970										
		2.630										
	TP-5				7.980	7.630	430.5852	430.5833				70.5
					7.630							
					7.275						152.5	
		3.970	3.210	433.7952								
		3.210										
		2.445										
	TP-6				7.685	6.930	426.8652	426.8629				151.5
					6.930							
					6.170							

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FOIT-ALBERT ASSOCIATES

PROJECT P.I.N.	16001.30 51755	DATUM NAVD 83	UNITS FT	INSTRUMENT: LEICA DISTA 03 SERIAL NO.: 333205	DATE 1-19-17	WEATHER 35°F CLOUDY	P.C. SS	INST. MM	ROD JL	SHEET 2 OF 3
TURN	3 WIRE BS	BS (+)	HI	FS (-)	ELEV.	ADJ. ELEV.	DESCRIPTION		DISTANCE +	
	4.465 3.700 2.940	3.700	430.5652						152.5	
TP-7				9.740 8.990	420.8252	420.8225				150.0
	3.000 2.245 1.485	2.245	423.0702						151.5	
TP-8				7.820 7.090 6.350	415.9802	415.9772				147.0
	15.230 4.900 4.570	4.900	420.8802						66.0	
TP-9				6.435 6.075 5.720	414.8052	414.8018	C.B.P # 2			71.5
	6.120 5.700 5.400	5.700	420.5652						72.0	
TP-10				4.910 4.565 4.260	418.9802	418.9764				65.0
	7.820 7.105 6.390	7.105	423.0852						143.0	
TP-11				3.705 2.965 2.225	420.1202	420.1160				148.0
	8.960 8.245 7.530	8.245	428.3652						143.0	
TP-12				2.385 1.630 0.865	426.7352	426.7300				152.0

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②

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LEVEL LOOP NO. 2

Loop 2

FOIT-ALBERT ASSOCIATES

PROJECT 16001.30 SITES			DATUM NAVD 88		INSTRUMENT: LEICA DINA03		DATE 1-20-17		WEATHER 35° CLOUDY JS		P.C.		INST. MM		ROD JC		SHEET 1 OF 3					
TURN		3 WIRE BS		BS (+)		HI		3 WIRE FS		FS (-)		ELEV.		ADJ. ELEV.		DESCRIPTION		DISTANCE +				
		5.330	4.615	4.615	436.2152							431.6002				143.0						
		4.615	11.360																10.585	425.6302	425.6317	C.B.P. #1 - BEGAR ALUM CAP
		3.900	9.805																			
P-1		6.770	6.080	6.080	431.7102																	
		6.080	5.390									425.0202	425.0232									
		5.390	7.650																6.690			C.B.P. #4 - BEGAR ALUM CAP
			5.720																			
P-2		6.300	5.600	5.600	430.6202																	
		5.600	4.890									426.1552	426.1597									
			5.160																4.465			C.B.P. #4 - BEGAR ALUM CAP
			3.770																			
P-3		5.390	4.630	4.630	430.7852																	
		4.630	3.870									422.0792	422.0852									
			9.460																8.706			C.B.P. #4 - BEGAR ALUM CAP
			7.950																			
P-4		4.690	4.000	4.000	426.0792																	
		4.000	3.300									418.5942	418.6017									
			8.100																7.485			C.B.P. #4 - BEGAR ALUM CAP
			6.860																			
P-5		10.870	10.100	10.100	428.7542																	
		10.100	9.440									420.5442	420.5552									
			8.970																8.210			C.B.P. #4
			7.440																			
P-6																						

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[illegible]

PROJECT 16001.30 SITES		DATUM		UNITS		INSTRUMENT: LEICA DTM103		DATE		WEATHER		P.C.		INST.		ROD		SHEET			
P.I.N.		MAY 2003		FT		SERIAL NO.: 333205		1-20-17		350 CLOUDY		33		M.M		35		3 OF 3			
TURN	3 WIRE BS	BS (+)	HI	3 WIRE FS	FS (-)	ELEV.	ADJ. ELEV.	DESCRIPTION												DISTANCE	
TP-13	6.590	5.870	432.0742		4.745	427.3292	431.6002	CE.P. 2 - REBAR ALUM CAP	145.0	149.0											
	5.870																				
	5.140																				
TP-14	8.540	8.010	435.3292		3.760	431.5792	431.6002	-0.021	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	
	8.010																				
	7.480																				
		ACTUAL MISCLASURE			=	-0.021	431.5792	-431.6002	-0.021	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	
		ALLOWABLE MISCLASURE			=	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331	0.0331		

LEVEL LOOP NO. 3

LOOP 3

FOIT-ALBERT ASSOCIATES

PROJECT P.I.N.	1600/130 SITES	DATUM NAVD88	UNITS US FT	INSTRUMENT: LEICA DINA03	DATE 1-23-17	WEATHER 40's CLEAR	P.C.	INST. JK	ROD JK	SHEET / OF 2
TURN	3 WIRE BS	BS (+)	HI	FS (-)	ELEV.	ADJ. ELEV.	DESCRIPTION		DISTANCE +	
	2.700 2.145 1.590	2.145	442.494		440.3144		C.P.B.M #2 - L-CUT ON SW ABUTMENT WALL	111.0		
TP-1				12.70 12.105 11.510	430.3544	430.3533				119.0
	3.665 3.050 2.440	3.05	433.4044					122.5		
TP-2				8.500 7.905 7.310	425.4994	425.4916				119.0
	4.205 3.950 3.700	3.950	429.4494					50.5		
TP-3				9.200 8.920 8.680	420.5294	420.5254	C.B.P 10 - R.R. ALUM CAP			58.0
	3.710 3.045 2.310	3.045	423.5794					146.0		
TP-4				8.350 7.560 6.760	416.0144	416.0108				159.0
	4.980 4.240 3.50	4.240	420.2544					148.0		
TP-5				4.520 3.785 3.050	416.4694	416.4649				147.
	3.770 3.010 2.250	3.01	419.4794					152.0		
TP-6				6.385 5.515 4.645	413.9644	413.9590	C.P.B.M #3 - X-CUT N. POST OF SIGN NE BOLT			174.0
SS				8.350 8.350	411.1294		C.B.P 9 - R.R. ALUM CAP			

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FOIT-ALBERT ASSOCIATES

PROJECT P.I.N.	16001.30 SITES	DATUM NAVD83	UNITS FT	INSTRUMENT: SERIAL NO.: 333205	DATE 1-23-17	WEATHER 90% CLOUDY	P.C. 55	INST. JK	ROD JK	SHEET 2 OF 2
TURN	3 WIRE BS	BS (+)	HI	3 WIRE FS	FS (-)	ELEV.	ADJ. ELEV.	DESCRIPTION	DISTANCE +	-
	6.200 5.270 4.340	5.770	419.2344					CPBM #3 - X-CUT ON N. POST OF EXIT SIGN NE POST	186	
P-7				4.570 3.690 2.900	3.690	415.5444	415.5381			177.0
	6.245 5.360 4.480	5.360	418.9044						176	
P-8				4.840 3.890 2.930	3.890	417.0144	417.0072			191
	11.330 10.440 9.550	10.440	427.4544	3.730 2.840 1.960 3.730 2.840 1.960	2.840 2.840		424.6144		178.0	
P-9					2.840	424.6144	424.6063			177
	9.720 9.200 8.670	9.200	433.8144						105	
P-10				5.160 4.600 4.040	4.600	429.2144	429.2069			112
	13.720 13.280 12.850	13.280	442.4144						89.0	
P-11				2.640 2.170 1.690	2.170	440.3244	440.3144			95.0
		ACTUAL MISC. ASURE			=	440.3244 - 440.3144 0.01	=	0.01 / 11 = -0.00091 TURN	146.0	1528.0
		ALLOWABLE MISC. ASURE			=	0.03 $\sqrt{0.5667}$	=	0.0226 > 0.01 ✓	Σ = 2992.0 FT	

= 0.5667 11

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LEVEL LOOP NO. 4

LOOP 4

FOIT-ALBERT ASSOCIATES

PROJECT 16001, 30 STES		DATE		WEATHER		P.C.		INST.		ROD		SHEET	
P.I.N.		INSTRUMENT: LEICA DNA03		2-8-17		35° SUN		JTL				1 OF 2	
SERIAL NO.: 333205		ADJ. ELEV.		DESCRIPTION		DISTANCE							
TURN	3 WIRE BS (+)	HI	3 WIRE FS	FS (-)	ELEV.	ADJ. ELEV.	DESCRIPTION	DISTANCE					
	6.345	445.7094			440.3144		CPBM 2 - L-CUT ON SW CONC BRIDGE ABUTMENT.	191.5					
	5.370												
	4.430												
SS			7.019		438.9354	438.9354	CBP-3 R-C						
			6.769										
			6.519										
AP-2			10.590		436.0444	436.0444							186.0
			9.660										
			8.730										
	2.750	438.0341											
	1.990												
	1.228												
AP-2			9.740		429.0594	429.0594							153.0
			8.975										
			8.210										
	3.400	432.0894											
	3.030												
	2.660												
AP-3			8.840		423.7194	423.7194	CBP-7 R+C						94.0
			8.370										
			7.900										
	4.525	427.5094											
	3.790												
	3.055												
AP-4			6.430		421.8044	421.8044							145.0
			5.705										
			4.980										
	6.475	427.7464											
	5.942												
	5.405												
AP-5			6.123		422.2514	422.2514	CBP-6 R+C						125.5
			5.495										
			4.870										
	6.330	427.7964											156.0
	5.545												
	4.770												

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FOIT-ALBERT ASSOCIATES

PROJECT / 6001.3 051725			DATUM		UNITS		INSTRUMENT: LEICA DNA 03		DATE		WEATHER	P.C.	INST.	ROD	SHEET
P.I.N.	3 WIRE BS	BS (+)	HI	3 WIRE FS	FS (-)	ELEV.	ADJ. ELEV.	DESCRIPTION	DISTANCE						
TP-6				6.050											
				5.260	5.260	422.5364	422.5492								158.5
	6.360	5.630	428.1664	4.465											
	5.630														
TP-7	4.910														
				5.705	4.950	423.2164	423.2313	CBP-S R+C							151.5
				4.190											
	4.210	3.430	426.6464												
TP-8	3.430														
	2.650														
				9.000	8.065	418.5814	418.5984								187.0
	7.450	6.525	425.1664	7.130											
TP-9	6.525														
	5.600														
				5.100	4.340	420.7664	420.7856								153.0
	6.190	5.370	426.1364	4.340											
TP-10	5.370			3.570											
	4.545														
				8.537	7.513	418.6234	418.6447	CPBM-1 = X-CUT ON S 4 5' GAN POST SW BOLT							199.4
				7.513											
				6.543											
		ACTUAL MISMEASURE				418.6447 418.6234 - 0.0213	= + 0.0213 / 0 = 0.02213 TURN								1552.7
		ALLOWABLE MISMEASURE				0.0310.5740	= 0.0237 0.0213 ✓								0.5740

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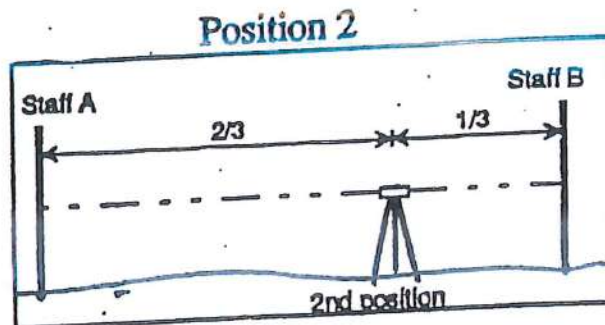
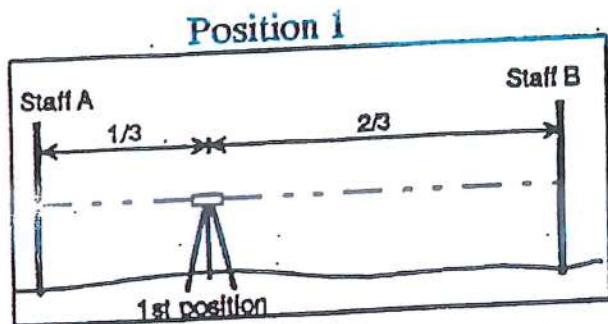
PEG TESTS



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Architecture, Engineering and Surveying, P.C.

DB 16001.30
SHEET NO. _____ OF _____

CALCULATED BY JS, MM, JC DATE 1-19-17
CHECKED BY 35° CLOUDY DATE _____
SCALE _____



1ST SET-UP

A 4.005

B 5.715

Δ ELEV -1.71 ($A' - B'$)

DIFF +0.004 ✓

Δ COLLIMATION _____
ABSOLUTE COLLIMATION _____

CALCULATED ROD READING FOR CHECK @ A2 _____

ACTUAL ROD READING @ A2 (AFTER ELECTRONIC CALIBRATION) _____

2ND SET-UP

B 4.965

A 3.250

Δ ELEV +1.715 ($B^2 - A^2$)

DATE: 1-19-17

INST.: LEICA DNA 03

P.C.: JS

PROJECT: 16001.30

PER. NO.: _____

π : MM

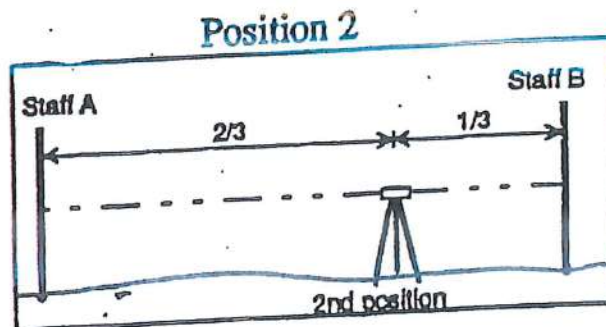
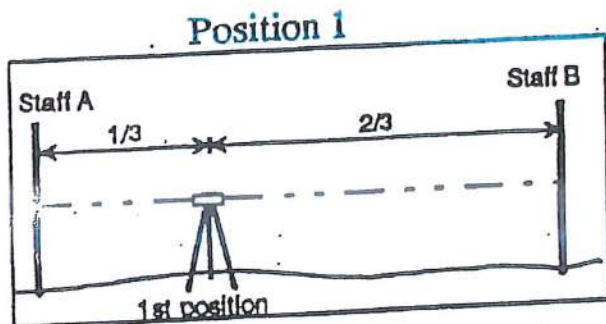
γ : SC



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Architecture, Engineering and Surveying, P.C.

OB 16001.30
HEET NO. _____ OF _____

CALCULATED BY JS, MM, JL DATE 1-20-17
CHECKED BY DS° CLOUDY DATE _____
SCALE _____



1ST SET-UP

A +4.310
B -5.680

Δ ELEV 1.370 (A' - B')

2ND SET-UP

B +4.990
A -3.615

Δ ELEV 1.375 (B' - A')

DIFF 0.005 ✓

Δ COLLIMATION _____
ABSOLUTE COLLIMATION _____

CALCULATED ROD READING FOR CHECK @ A2 _____

ACTUAL ROD READING @ A2 (AFTER ELECTRONIC CALIBRATION) _____

DATE: 1-20-17

INST.: LEICA DNA 03

P.C.: JS

PROJECT: 16001.30

PER. NO.: _____

T: MM

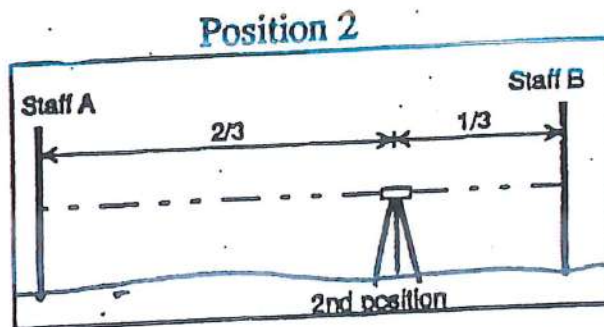
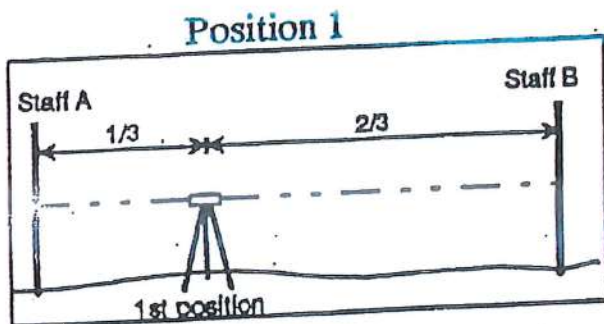
JL



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

OB 16001.30 SITE 5
HEET NO. _____ OF _____

CALCULATED BY JS DATE 1-23-17
CHECKED BY _____ DATE _____
SCALE _____



1ST SET-UP

A 4.310

B 5.685

Δ ELEV 1.375 ($A' - B'$)

DIFF 0.000 ✓

Δ COLLIMATION _____
ABSOLUTE COLLIMATION _____

CALCULATED ROD READING FOR CHECK @ A2 _____

ACTUAL ROD READING @ A2 (AFTER ELECTRONIC CALIBRATION) _____

2ND SET-UP

B 4.945

A 3.570

Δ ELEV 1.375 ($B^2 - A^2$)

DATE: 1-24-17

INST.: LEICA DNA 03

P.C.: JS

PROJECT: 16001.30

PER. NO.: _____

π : SK

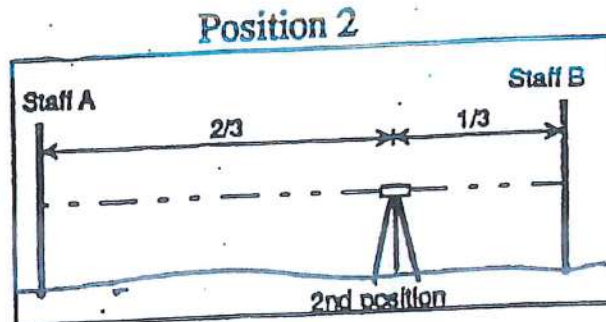
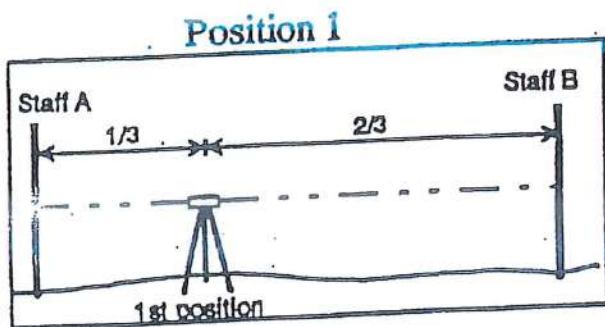
γ : SC



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DB 16001.30
SHEET NO. _____ OF _____

CALCULATED BY MM, JK DATE 2-8-17
CHECKED BY 400 RAIN DATE _____
SCALE _____



1ST SET-UP

A 4.346

B 5.725

Δ ELEV -1.379 ($A' - B'$)

DIFF -0.001 ✓

Δ COLLIMATION _____

ABSOLUTE COLLIMATION _____

CALCULATED ROD READING FOR CHECK @ A2 _____

ACTUAL ROD READING @ A2 (AFTER ELECTRONIC CALIBRATION) _____

2ND SET-UP

B 5.139

A 3.761

Δ ELEV +1.378 ($B^2 - A^2$)

DATE: 2-8-17

INST.: LEICA DNA 03

P.L.: MM

PROJECT: 16001.30

PER. NO.: _____

π : JK

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

Exposure 4-step (1x, 2x, 4x, 8x)

Brightness Automatic

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)
Servo system	MagDrive servo technology, integrated servo/angle sensor electromagnetic direct drive
Rotation speed	115 degrees/sec (128 gon/sec)
Rotation time Face 1 to Face 2	2.6 sec
Positioning time 180 degrees (200 gon)	2.6 sec
Clamps and slow motions	Servo-driven, endless fine adjustment
Centering	
Centering system	Trimble 3-pin
Optical plummet	Built-in optical plummet
Magnification/shortest focusing distance	2.3x/0.5 m-infinity (1.6 ft-infinity)
Telescope	
Magnification	.30x
Aperture	40 mm (1.57 in)
Field of view at 100 m (328 ft)	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)
Tracklight built in	Not available in all models
Operating temperature	-20 °C to +50 °C (-4 °F to +122 °F)
Dust and water proofing	IP55
Humidity	100% condensing
Power supply	
Internal battery	Rechargeable Li-Ion battery 11.1 V, 5.0 Ah
Operating time ^a	
One internal battery	Approx. 6.5 hours
Three internal batteries in multi-battery adapter	Approx. 20 hours
Robotic holder with one internal battery	13.5 hours
Operating time for video robotic ^a	
One battery	5.5 hours
Three batteries in multi-battery adapter	17 hours
Weight	
Instrument (servo/Autolock)	5.15 kg (11.35 lb)
Instrument (Robotic)	5.25 kg (11.57 lb)
Trimble CU controller	0.4 kg (0.88 lb)
Tribrach	0.7 kg (1.54 lb)
Internal battery	0.35 kg (0.77 lb)
Trunnion axis height	196 mm (7.71 in)
Communication	USB, Serial, Bluetooth [®] s
Security	Dual-layer password protection; available on some models

TRIMBLE S6 TOTAL STATION

ROBOTIC SURVEYING

Autolock and Robotic Range ¹	500 m–700 m (1,640–2,297 ft)
Passive prisms	800 m (2,625 ft)
Trimble MultiTrack Target	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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Trimble Navigation
Singapore Pty Limited
80 Marine Parade Road
#22-06, Parkway Parade
Singapore 449269
SINGAPORE



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_now_gsa.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 optimal
- 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, GSOE, 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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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	



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729342en – X.02 – RDV

Certificate Of Calibration

Calibration Date: 3/4/2016

Instrument Model: Trimble S6

Serial Number: 93010506

Technician: George Scott

Next Due Date: 3/4/2017

Angles / Axis:

Before:
X/H: 0.0019g

After:
X/H: 0.0018g

Autolock:

Y/V: -77.8068g
H: -0.0008g

Y/V: -77.8081g
H: -0.0007g

O.P. ✓

Vial: ✓

EDM: ✓

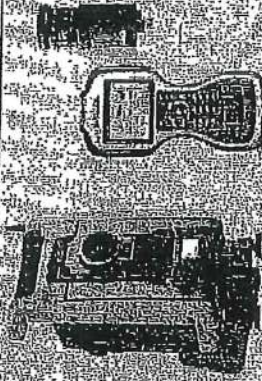
Radio: ✓

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

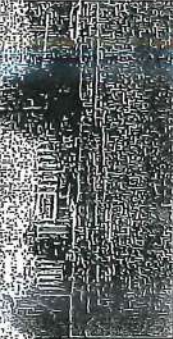
The calibration of this instrument is guaranteed to be within product specifications when the unit leaves Keystone Precision Instruments. Neither Keystone Precision Instruments nor representative will assume liability incurred during use of this unit should unit lose calibration.

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1-800-833-9250
WWW.KEYPRE.COM



Preferred Service Provider



COMPUTER FILES

D214386
New York State Thruway Authority
Design Phase I-IV, Replacement of 8 Syracuse Division Bridges
Exit 35 Ramp Bridge over Mainline (BIN 5510090)
Mile Post 278.93 in the Syracuse Division
Onondaga County

List of Computer Files

D214386_map_surv_base_site 5_3D.dgn
D214386_map_surv_points_site 5_3D.dgn
D214386_map_surv_dtm_site 5_3D.dgn
D214386_map_surv_text_site 5_2D.dgn
D214386_map_surv_control_site 5_3D.dgn
D214386_map_surv_row_site 5_2D.dgn
D214386_map_surv_bridge deck_site 5.dtm
D214386_map_surv_existing ground_site 5.dtm
D214386_dat_surv_site 5.fwd

List of Field Files

1600130SITE5.csv
1600130SITE5A.csv
1600130SITE5B.csv
1600130SITE5C.csv
1600130SITE5D.csv
1600130SITE5E.csv
1600130SITE5F.csv
1600130SITE5G.csv
1600130SITE5H.csv
1600130SITE5I.csv
1600130SITE5J.csv
1600130SITE5K.csv
1600130SITE5L.csv
1600130SITE5M.csv
1600130SITE5N.csv
1600130SITE5O.csv
1600130SITE5P.csv
1600130SITE5Q.csv
1600130SITE5R.csv
1600130SITE5RA.rw5
1600130SITE5RB.rw5
1600130SITE5RC.rw5
1600130SITE5RD.rw5
1600130SITE5RE.rw5
1600130SITE5RF.rw5
1600130SITE5RG.rw5