



*An integrated team of geospatial, engineering, and natural resource consultants,
Sewall partners with clients to create practical, sustainable solutions.*

Ground Control Report

Ground Control Quality & Blind Check Points for the Coastal Northeast LiDAR project

State of Connecticut Project – Eastern Portion

USGS Task Order G10PD02143 and G10PD01027

Prepared for:
Photo Science, Inc.

2 March 2011



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Sewall partners with clients to create practical, sustainable solutions.*

Control Survey Report

**Eastern Connecticut Ground Control Quality & Blind Check Points
For the Northeast LiDAR Project
Task Order No.: G10PD02143 and G10PD01027
US Geological Survey
1400 Independence Road
Rolla, Missouri 65401**

James W. Sewall Company was contracted by Photo Science, Inc. to locate a total of 11 quality assurance check points for this project. These points were divided into the following point designations: 7 BP's and 4 WST's. These points were located on relatively flat terrain on surfaces that generally consisted of grass, gravel or bare earth.

Field work was conducted by three staff surveyors from December 2010 to January 2011 with Topcon dual-frequency survey grade GPS receivers to locate the check points. Static sessions lasting a minimum of twenty minutes were conducted. A published control point was located during the course of the day to serve as a check. GPS session log sheets were filled out and photos taken of each point which accompany this report.

The data was submitted to NGS using the OPUS-RS utility. A sample of the data was post processed in Trimble Geomatics Office against the nearest Continuously Operating Reference Station (CORS) to check the OPUS-RS results.

The horizontal coordinates are Universal Transverse Mercator (UTM) coordinate system Zone 19; units are in meters, and the datum is the North American Datum of 1983 (NAD83). Vertical data is in the North American Vertical Datum of 1988 (NAVD88) Geoid09.



Ground Control Report Coastal Northeast LiDAR Project Connecticut

GPS Control Survey Results

- 1.0 Coordinate Summary and Overview Map Location
- 2.0 Field Data Sheets & OPUR RS Solution Reports
- 3.0 Published Control Locations



1.0 Coordinate Summary
 and Overview Map

| |
|------------------------|
| Control Summary |
|------------------------|

Project Number: 75980S - Connecticut
 Project Name: Photo Science Inc - NE Lidar Project - BP data
 Horizontal Datum: UTM NAD83 (Zone 19)
 Vertical Datum: NAVD 88 (GEOID09)
 Units: Meters
 Date: January 25, 2011

| Station | Easting (X) | Northing (Y) | Elevation | Description |
|---------|-------------|--------------|-----------|-------------|
| BP11 | 261333.968 | 4582500.423 | 14.126 | 8" spike |
| BP12 | 255684.590 | 4591022.432 | 89.383 | 8" spike |
| BP13 | 265418.446 | 4592535.206 | 27.243 | 8" spike |
| BP14 | 257602.019 | 4598114.287 | 101.982 | 8" spike |
| BP15 | 265487.578 | 4604415.712 | 155.044 | 8" spike |
| BP16 | 264975.462 | 4613334.302 | 158.196 | 8" spike |
| BP17 | 263029.318 | 4598776.484 | 146.330 | 8" spike |

| |
|----------------------------------|
| Published Control Summary |
|----------------------------------|

| Station | Easting (X) | Northing (Y) | Elevation | Name |
|---------|-------------|--------------|-----------|--------|
| WE 002 | 268780.604 | 4581516.553 | 22.126 | WE 002 |

Notes: 1. Coordinates and elevations were derived from our GPS observations using OPUS RS processing and also Topcon Tools.
 2. Datum and unit conversions performed using Corpscon v.6.0.1 software.

| |
|------------------------|
| Control Summary |
|------------------------|

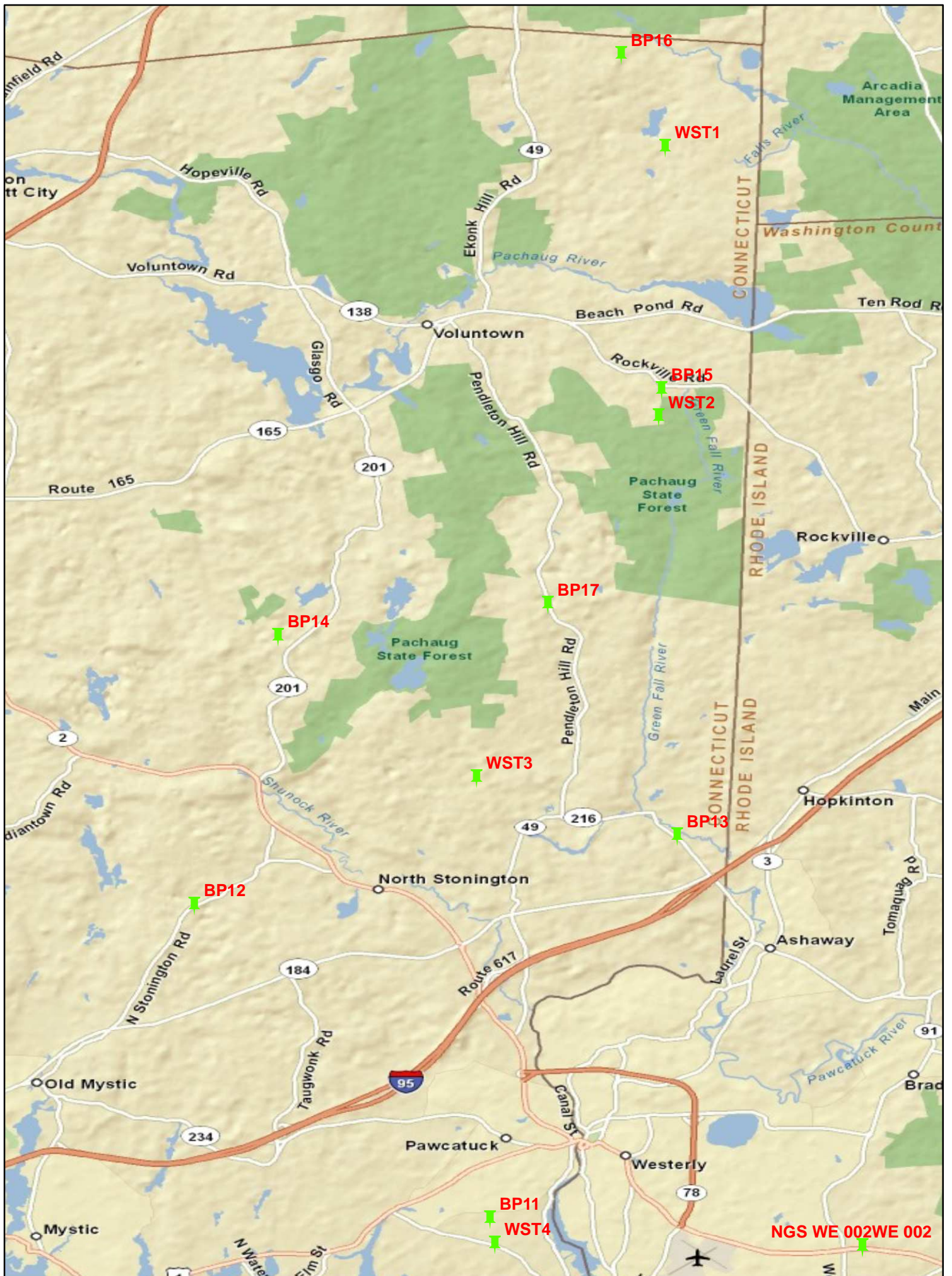
Project Number: 75980S - Connecticut
 Project Name: Photo Science Inc - NE Lidar Project - WST data
 Horizontal Datum: UTM NAD83 (Zone 19)
 Vertical Datum: NAVD 88 (GEOID09)
 Units: Meters
 Date: January 25, 2011

| Station | Easting (X) | Northing (Y) | Elevation | Description |
|---------|-------------|--------------|-----------|-------------|
| WST1 | 265769.287 | 4610845.032 | 107.583 | 8" spike |
| WST2 | 265407.759 | 4603680.940 | 147.654 | 8" spike |
| WST3 | 261450.504 | 4594216.665 | 58.895 | 8" spike |
| WST4 | 261405.325 | 4581825.675 | 19.422 | 8" spike |

| |
|----------------------------------|
| Published Control Summary |
|----------------------------------|

| Station | Easting (X) | Northing (Y) | Elevation | Name |
|------------|-------------|--------------|-----------|--------|
| NGS WE 002 | 268780.604 | 4581516.553 | 22.126 | WE 002 |

- Notes:
- Coordinates and elevations were derived from our GPS observations using OPUS RS processing and also Topcon Tools.
 - Datum and unit conversions performed using Corpscon v.6.0.1 software.



NGS WE 002WE 002



2.0 Field Data Sheets,
OPUS RS Solution Reports &
TGO Processing

Offices nationwide
sewall.com

136 Center Street
P.O. Box 433
Old Town, Maine 04468

207 827 4456
fax: 207 827 3641
800 648 4202

JOB REFERENCE
NE LIDAR

POINT ID: CT WST 1
Proj. No.: 75980S

STATE Connecticut

COUNTY New London

LOCATION: Voluntown

OPERATOR E Jellison

GPS OBSERVATIONS

RECEIVER MODEL TOPCON HIPER GD

LATITUDE N 41-36-54

LONGITUDE W 071-48-41

RECEIVER S/N 272-0793

SESSION
H

DATE: 12/07/10
DAY OF YEAR 341

ANTENNA INFO

RADIUS (M)
Antenna Serial #
Antenna Type

START TIME 13:00
END TIME 13:21

U.T.C.
 LOCAL

ANTENNA HEIGHT (SLANT)

MTRS/FT
MEASURED **FIXED HGT.**

Collection Rate
5 **SECONDS**

ANTENNA HEIGHT (ARP)

MTRS/FT 1.8 Meters
MEASURED **FIXED HGT**

TOP OF MONUMENT IS: **FLUSH**
MTRS/FEET **ABOVE GROUND**
MTRS/FEET **BELOW GROUND**

DESCRIPTION

Bridge Spike

AERIAL TARGET
PUB. BENCH MARK
PUB. CONTROL

PHOTO I.D.
 NEW CONTROL
NATURAL

PHOTOS:



PHOTOS CONT'D:



SITE SKETCH:



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JOB REFERENCE
NE LIDAR

POINT ID: CT WST 2
Proj. No.: 75980S

STATE Connecticut

COUNTY New London

LOCATION: Voluntown

OPERATOR E Jellison

GPS OBSERVATIONS

RECEIVER MODEL TOPCON HIPER GD

LATITUDE N 41-33-01

RECEIVER S/N 272-0793

LONGITUDE W 071-48-46

HGT. MTS 147.65

ANTENNA INFO

RADIUS (M)

Antenna Serial #

Antenna Type

SESSION
G

DATE: 12/07/10
DAY OF YEAR 341

START TIME 12:18
END TIME 12:38

U.T.C.
 LOCAL

ANTENNA HEIGHT (SLANT)

MTRS/FT

MEASURED **FIXED HGT.**

Collection Rate
5 **SECONDS**

ANTENNA HEIGHT (ARP)

MTRS/FT 1.8 Meters

MEASURED **FIXED HGT**

TOP OF MONUMENT IS: **FLUSH**

MTRS/FEET **ABOVE GROUND**

MTRS/FEET **BELOW GROUND**

DESCRIPTION

Bridge Spike

AERIAL TARGET

PUB. BENCH MARK

PUB. CONTROL

PHOTO I.D.

NEW CONTROL

NATURAL

PHOTOS:



PHOTOS CONT'D:



SITE SKETCH:



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JOB REFERENCE
NE LIDAR

POINT ID: CT WST 3
Proj. No.: 75980S

STATE Connecticut **COUNTY** New London **LOCATION:** N Stoningham

OPERATOR E Jellison

GPS OBSERVATIONS

RECEIVER MODEL TOPCON HIPER GD
RECEIVER S/N 272-0793

| | | | |
|------------------|-------------|-----------------|-------|
| LATITUDE | N 41-27-51 | HGT. MTS | |
| LONGITUDE | W 071-51-23 | | 58.90 |

ANTENNA INFO

RADIUS (M)

Antenna Serial #

Antenna Type

SESSION
D

DATE: 12/07/10
DAY OF YEAR 341

START TIME 10:05
END TIME 10:25

U.T.C.
 LOCAL

ANTENNA HEIGHT (SLANT)

MTRS/FT

MEASURED **FIXED HGT.**

Collection Rate
5 SECONDS

ANTENNA HEIGHT (ARP)

MTRS/FT 1.8 Meters

MEASURED **FIXED HGT**

TOP OF MONUMENT IS: **FLUSH**

MTRS/FEET ABOVE GROUND

MTRS/FEET BELOW GROUND

DESCRIPTION

Bridge Spike

AERIAL TARGET

PUB. BENCH MARK

PUB. CONTROL

PHOTO I.D.

NEW CONTROL

NATURAL

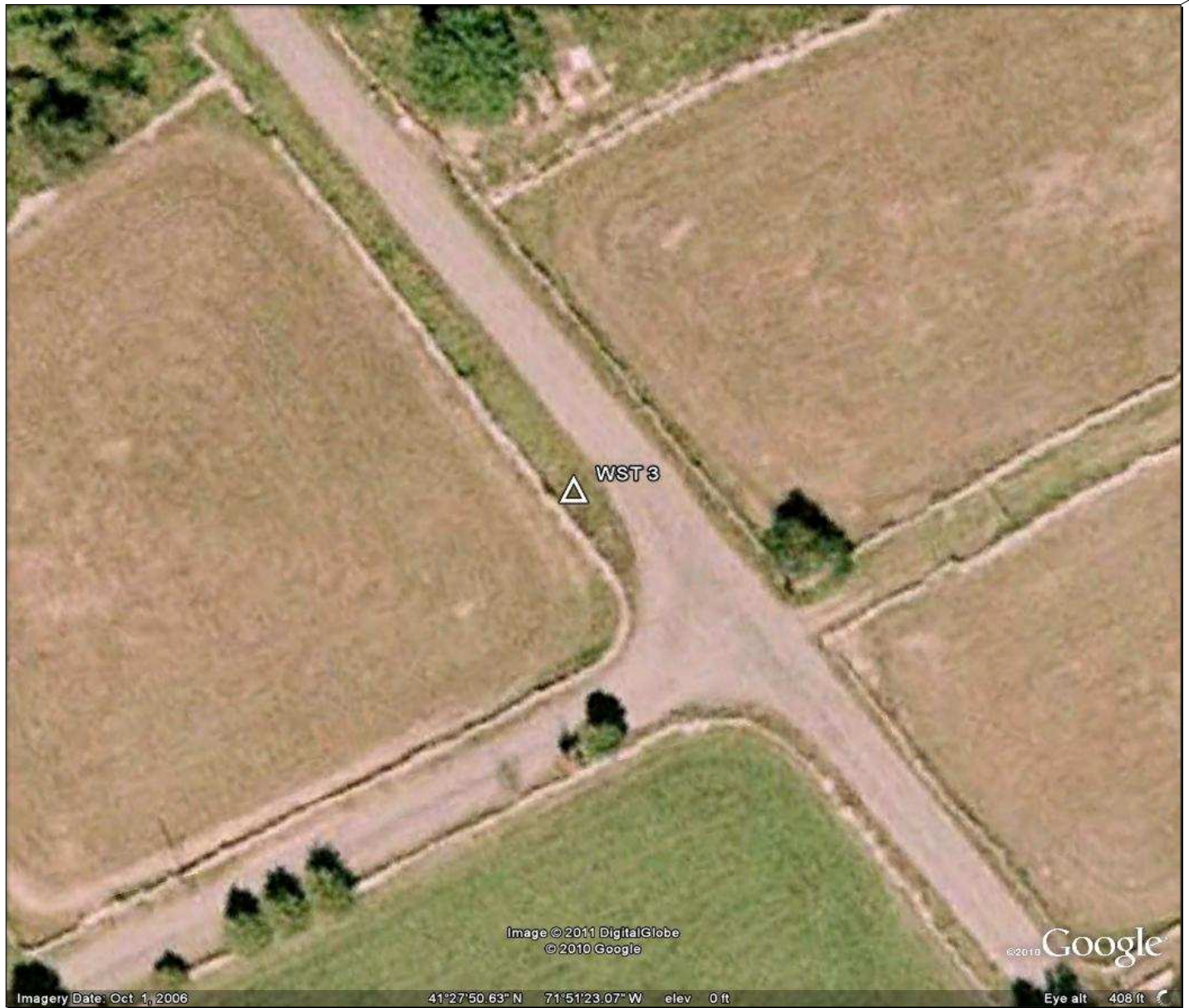
PHOTOS:



PHOTOS CONT'D:



SITE SKETCH:



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JOB REFERENCE
NE LIDAR

POINT ID: CT WST 4
Proj. No.: 75980S

STATE Connecticut **COUNTY** New London **LOCATION:** Pawcatuck

OPERATOR E Jellison

GPS OBSERVATIONS

RECEIVER MODEL TOPCON HIPER GD
RECEIVER S/N 272-0793

| | | | |
|------------------|-------------|-----------------|-------|
| LATITUDE | N 41-21-09 | HGT. MTS | |
| LONGITUDE | W 071-51-08 | | 19.42 |

ANTENNA INFO

RADIUS (M)

Antenna Serial #

Antenna Type

SESSION
A

DATE: 12/07/10
DAY OF YEAR 341

START TIME 07:41
END TIME 08:02

U.T.C.
 LOCAL

ANTENNA HEIGHT (SLANT)

MTRS/FT

MEASURED **FIXED HGT.**

Collection Rate
5 SECONDS

ANTENNA HEIGHT (ARP)

MTRS/FT 1.8 Meters

MEASURED **FIXED HGT**

TOP OF MONUMENT IS: **FLUSH**

MTRS/FEET ABOVE GROUND

MTRS/FEET BELOW GROUND

DESCRIPTION

Bridge Spike

AERIAL TARGET

PUB. BENCH MARK

PUB. CONTROL

PHOTO I.D.

NEW CONTROL

NATURAL

PHOTOS:



PHOTOS CONT'D:



SITE SKETCH:



**GPS CONTROL SURVEY
FIELD DATA SHEET**

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sewall.com

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JOB REFERENCE
NE LIDAR

POINT ID: CT BP 11
Proj. No.: 75980S

STATE Connecticut

COUNTY New London

LOCATION: Pawcatuck

OPERATOR E Jellison

GPS OBSERVATIONS

RECEIVER MODEL TOPCON HIPER GD
RECEIVER S/N 272-0793

| | | | |
|------------------|-------------|-----------------|-------|
| LATITUDE | N 41-21-31 | HGT. MTS | |
| LONGITUDE | W 071-51-12 | | 14.13 |

ANTENNA INFO

RADIUS (M)

Antenna Serial #

Antenna Type

SESSION
B

DATE: 12/07/10
DAY OF YEAR 341

START TIME 08:18
END TIME 08:39

U.T.C.
 LOCAL

ANTENNA HEIGHT (SLANT)

MTRS/FT

MEASURED **FIXED HGT.**

Collection Rate
5 SECONDS

ANTENNA HEIGHT (ARP)

MTRS/FT 1.8 Meters

MEASURED **FIXED HGT**

TOP OF MONUMENT IS: **FLUSH**

MTRS/FEET ABOVE GROUND

MTRS/FEET BELOW GROUND

DESCRIPTION

Bridge Spike

AERIAL TARGET

PUB. BENCH MARK

PUB. CONTROL

PHOTO I.D.

NEW CONTROL

NATURAL

PHOTOS:



PHOTOS CONT'D:



SITE SKETCH:



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JOB REFERENCE
NE LIDAR

POINT ID: CT BP 12
Proj. No.: 75980S

STATE Connecticut

COUNTY New London

LOCATION: Stonington

OPERATOR E Jellison

GPS OBSERVATIONS

RECEIVER MODEL TOPCON HIPER GD

LATITUDE N 41-26-01

RECEIVER S/N 272-0793

LONGITUDE W 071-55-27

| ANTENNA INFO | |
|-------------------------|--|
| RADIUS (M) | |
| Antenna Serial # | |
| Antenna Type | |

| SESSION | |
|---------|---|
| | C |

| | |
|--------------------|----------|
| DATE: | 12/07/10 |
| DAY OF YEAR | 341 |

| | |
|-------------------|-------|
| START TIME | 09:08 |
| END TIME | 09:29 |

| | |
|---|--------|
| | U.T.C. |
| X | LOCAL |

| ANTENNA HEIGHT (SLANT) | |
|-----------------------------------|-------------------------------------|
| MTRS/FT | |
| <input type="checkbox"/> MEASURED | <input type="checkbox"/> FIXED HGT. |

| Collection Rate | |
|-----------------|---------|
| 5 | SECONDS |

| ANTENNA HEIGHT (ARP) | |
|-----------------------------------|--|
| MTRS/FT | 1.8 Meters |
| <input type="checkbox"/> MEASURED | <input checked="" type="checkbox"/> X <input type="checkbox"/> FIXED HGT |

| | | |
|----------------------------|---|--------------|
| TOP OF MONUMENT IS: | X | FLUSH |
| MTRS/FEET | | ABOVE GROUND |
| MTRS/FEET | | BELOW GROUND |

| DESCRIPTION | |
|-------------|--------------|
| | Bridge Spike |

| | |
|--------------------------|-----------------|
| <input type="checkbox"/> | AERIAL TARGET |
| <input type="checkbox"/> | PUB. BENCH MARK |
| <input type="checkbox"/> | PUB. CONTROL |

| | |
|--------------------------|-------------|
| <input type="checkbox"/> | PHOTO I.D. |
| X | NEW CONTROL |
| <input type="checkbox"/> | NATURAL |

PHOTOS:



PHOTOS CONT'D:



SITE SKETCH:



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JOB REFERENCE
NE LIDAR

POINT ID: CT BP 13
Proj. No.: 75980S

STATE Connecticut **COUNTY** New London **LOCATION:** North Stonington

OPERATOR E Jellison

GPS OBSERVATIONS

RECEIVER MODEL TOPCON HIPER GD

LATITUDE N 41-27-00 **HGT. MTS**

RECEIVER S/N 272-0793

LONGITUDE W 071-48-30 27.24

ANTENNA INFO

RADIUS (M)

Antenna Serial #

Antenna Type

SESSION
K

DATE: 12/07/10
DAY OF YEAR 341

START TIME 15:23
END TIME 15:43

U.T.C.
 LOCAL

ANTENNA HEIGHT (SLANT)

MTRS/FT

MEASURED **FIXED HGT.**

Collection Rate
5 SECONDS

ANTENNA HEIGHT (ARP)

MTRS/FT 1.8 Meters

MEASURED **FIXED HGT**

TOP OF MONUMENT IS: **FLUSH**

MTRS/FEET ABOVE GROUND

MTRS/FEET BELOW GROUND

DESCRIPTION

Bridge Spike

AERIAL TARGET

PUB. BENCH MARK

PUB. CONTROL

PHOTO I.D.

NEW CONTROL

NATURAL

PHOTOS:



PHOTOS CONT'D:



SITE SKETCH:



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JOB REFERENCE
NE LIDAR

POINT ID: CT BP 14
Proj. No.: 75980S

STATE Connecticut **COUNTY** New London **LOCATION:** North Stonington

OPERATOR E Jellison

GPS OBSERVATIONS

RECEIVER MODEL TOPCON HIPER GD
RECEIVER S/N 272-0793

| | | | |
|------------------|-------------|-----------------|--------|
| LATITUDE | N 41-29-53 | HGT. MTS | |
| LONGITUDE | W 071-54-14 | | 101.98 |

ANTENNA INFO

RADIUS (M)

Antenna Serial #

Antenna Type

SESSION
E

DATE: 12/07/10
DAY OF YEAR 341

START TIME 11:01
END TIME 11:21

U.T.C.
 LOCAL

ANTENNA HEIGHT (SLANT)

MTRS/FT

MEASURED **FIXED HGT.**

Collection Rate
5 SECONDS

ANTENNA HEIGHT (ARP)

MTRS/FT 1.8 Meters

MEASURED **FIXED HGT**

TOP OF MONUMENT IS: **FLUSH**

MTRS/FEET ABOVE GROUND

MTRS/FEET BELOW GROUND

DESCRIPTION

Bridge Spike

AERIAL TARGET

PUB. BENCH MARK

PUB. CONTROL

PHOTO I.D.

NEW CONTROL

NATURAL

PHOTOS:



PHOTOS CONT'D:



SITE SKETCH:



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JOB REFERENCE
NE LIDAR

POINT ID: CT BP 15
Proj. No.: 75980S

STATE Connecticut

COUNTY New London

LOCATION: Voluntown

OPERATOR E Jellison

GPS OBSERVATIONS

RECEIVER MODEL TOPCON HIPER GD

LATITUDE N 41-33-25

RECEIVER S/N 272-0793

LONGITUDE W 071-48-44

HGT. MTS 155.04

ANTENNA INFO

RADIUS (M)

Antenna Serial #

Antenna Type

SESSION
F

DATE: 12/07/10
DAY OF YEAR 341

START TIME 11:46
END TIME 12:06

U.T.C.
 LOCAL

ANTENNA HEIGHT (SLANT)

MTRS/FT

MEASURED **FIXED HGT.**

Collection Rate
5 **SECONDS**

ANTENNA HEIGHT (ARP)

MTRS/FT 1.8 Meters

MEASURED **FIXED HGT**

TOP OF MONUMENT IS: **FLUSH**

MTRS/FEET **ABOVE GROUND**

MTRS/FEET **BELOW GROUND**

DESCRIPTION

Bridge Spike

AERIAL TARGET **PHOTO I.D.**

PUB. BENCH MARK **NEW CONTROL**

PUB. CONTROL **NATURAL**

PHOTOS:



PHOTOS CONT'D:



SITE SKETCH:



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JOB REFERENCE
NE LIDAR

POINT ID: CT BP 16
Proj. No.: 75980S

STATE Connecticut **COUNTY** New London **LOCATION:** Voluntown

OPERATOR E Jellison

GPS OBSERVATIONS

RECEIVER MODEL TOPCON HIPER GD

LATITUDE N 41-38-14 **HGT. MTS**

RECEIVER S/N 272-0793

LONGITUDE W 071-49-18 158.20

ANTENNA INFO

SESSION
I

DATE: 12/07/10
DAY OF YEAR 341

RADIUS (M)
Antenna Serial #
Antenna Type

START TIME 13:42
END TIME 14:02

U.T.C.
 LOCAL

ANTENNA HEIGHT (SLANT)
MTRS/FT
 MEASURED **FIXED HGT.**

Collection Rate
5 **SECONDS**

ANTENNA HEIGHT (ARP)
MTRS/FT 1.8 Meters
 MEASURED **FIXED HGT**

TOP OF MONUMENT IS: **FLUSH**
MTRS/FEET **ABOVE GROUND**
MTRS/FEET **BELOW GROUND**

DESCRIPTION

Bridge Spike

AERIAL TARGET
 PUB. BENCH MARK
 PUB. CONTROL

PHOTO I.D.
 NEW CONTROL
 NATURAL

PHOTOS:



PHOTOS CONT'D:



SITE SKETCH:



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JOB REFERENCE
NE LIDAR

POINT ID: CT BP 17
Proj. No.: 75980S

STATE Connecticut **COUNTY** New London **LOCATION:** North Stonington

OPERATOR E Jellison

GPS OBSERVATIONS

RECEIVER MODEL TOPCON HIPER GD
RECEIVER S/N 272-0793

| | | | |
|------------------|-------------|-----------------|--------|
| LATITUDE | N 41-30-20 | HGT. MTS | |
| LONGITUDE | W 071-50-22 | | 146.33 |

ANTENNA INFO

RADIUS (M)

Antenna Serial #

Antenna Type

SESSION
J

DATE: 12/07/10
DAY OF YEAR 341

START TIME 14:47
END TIME 15:07

U.T.C.
 LOCAL

ANTENNA HEIGHT (SLANT)

MTRS/FT

MEASURED **FIXED HGT.**

Collection Rate
5 SECONDS

ANTENNA HEIGHT (ARP)

MTRS/FT 1.8 Meters

MEASURED **FIXED HGT**

TOP OF MONUMENT IS: **FLUSH**

MTRS/FEET ABOVE GROUND

MTRS/FEET BELOW GROUND

DESCRIPTION

Bridge Spike

AERIAL TARGET

PUB. BENCH MARK

PUB. CONTROL

PHOTO I.D.

NEW CONTROL

NATURAL

PHOTOS:



PHOTOS CONT'D:



SITE SKETCH:



WST 1

FILE: 0793log1207h.tps 000180704

NGS OPUS-RS SOLUTION REPORT
=====

USER: jeler@jws.com
RINEX FILE: 0793341s.10o

DATE: December 13, 2010
TIME: 19:19:42 UTC

SOFTWARE: rsgps 1.35.1 RS29.prl 1.65 START: 2010/12/07 18:01:05
EPHEMERIS: igr16132.eph [rapid] STOP: 2010/12/07 18:21:20
NAV FILE: brdc3410.10n OBS USED: 2295 / 2880 : 80%
ANT NAME: TPSHIPER_GD QUALITY IND. 21.07/ 0.37
ARP HEIGHT: 1.8 NORMALIZED RMS: 0.360

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2010.93358)

X: 1490685.047(m) 0.015(m) 1490684.277(m) 0.015(m)
Y: -4536947.037(m) 0.048(m) -4536945.599(m) 0.048(m)
Z: 4213777.818(m) 0.049(m) 4213777.746(m) 0.049(m)

LAT: 41 36 53.85669 0.008(m) 41 36 53.88952 0.008(m)
E LON: 288 11 19.49263 0.011(m) 288 11 19.48042 0.011(m)
W LON: 71 48 40.50737 0.011(m) 71 48 40.51958 0.011(m)
EL HGT: 77.355(m) 0.069(m) 76.106(m) 0.069(m)
ORTHO HGT: 107.583(m) 0.070(m) [NAVD88 (Computed using GEOID09)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 19) SPC (0600 CT)
Northing (Y) [meters] 4610845.032 239631.870
Easting (X) [meters] 265769.287 383040.914
Convergence [degrees] -1.86785996 0.62244571
Point Scale 1.00027521 0.99998414
Combined Factor 1.00026307 0.99997201

US NATIONAL GRID DESIGNATOR: 19TBG6576910845(NAD 83)

BASE STATIONS USED

| PID | DESIGNATION | LATITUDE | LONGITUDE | DISTANCE(m) |
|--------|----------------------------|-------------|--------------|-------------|
| DE6262 | URIL U OF RI COOP CORS ARP | N412920.158 | W0713139.778 | 27486.4 |
| DH5837 | CTPU PUTNAM CORS ARP | N415358.888 | W0715320.889 | 32281.5 |
| DH5835 | CTMA MANSFIELD CORS ARP | N414352.917 | W0721238.877 | 35695.6 |
| DI0966 | XMTS MTS FOX COOP CORS ARP | N420350.018 | W0711501.669 | 68234.1 |
| DH7113 | CTNE PAQUETTE CORS ARP | N414024.717 | W0724252.252 | 75532.0 |
| DH5833 | CTGU GILFORD CORS ARP | N411721.742 | W0724004.444 | 80194.2 |
| DE8093 | HAMP NORTHAMPTON CORS ARP | N421903.873 | W0723822.404 | 103959.2 |
| DI1874 | NYRH RIVERHEAD CORS ARP | N405524.088 | W0724250.560 | 107803.5 |
| DJ5206 | MOR5 MORICHES 5 CORS ARP | N404722.259 | W0724446.639 | 120640.3 |

NEAREST NGS PUBLISHED CONTROL POINT

LW3568 BOUNDARY STATE BOUND 0 CT RI N413715.464 W0714717.756 2026.3

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

WST 2

FILE: 0793log1207g.tps 000180703

NGS OPUS-RS SOLUTION REPORT

=====

USER: jeler@jws.com
RINEX FILE: 0793341r.10o

DATE: December 13, 2010
TIME: 19:11:44 UTC

SOFTWARE: rsgps 1.35.1 RS41.prl 1.65 START: 2010/12/07 17:18:35
EPHEMERIS: igr16132.eph [rapid] STOP: 2010/12/07 17:39:45
NAV FILE: brdc3410.10n OBS USED: 1512 / 2016 : 75%
ANT NAME: TPSHIPER_GD QUALITY IND. 39.42/ 29.07
ARP HEIGHT: 1.8 NORMALIZED RMS: 0.268

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2010.93350)

X: 1492058.305(m) 0.010(m) 1492057.535(m) 0.010(m)
Y: -4541536.462(m) 0.017(m) -4541535.023(m) 0.017(m)
Z: 4208441.058(m) 0.013(m) 4208440.985(m) 0.013(m)

LAT: 41 33 1.44981 0.006(m) 41 33 1.48260 0.006(m)
E LON: 288 11 13.97220 0.008(m) 288 11 13.96001 0.008(m)
W LON: 71 48 46.02780 0.008(m) 71 48 46.03999 0.008(m)
EL HGT: 117.339(m) 0.021(m) 116.088(m) 0.021(m)
ORTHO HGT: 147.654(m) 0.026(m) [NAVD88 (Computed using GEOID09)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 19) SPC (0600 CT)
Northing (Y) [meters] 4603680.940 232460.935
Easting (X) [meters] 265407.759 382990.877
Convergence [degrees] -1.86650977 0.62142894
Point Scale 1.00027731 0.99998318
Combined Factor 1.00025890 0.99996478

US NATIONAL GRID DESIGNATOR: 19TBG6540703680(NAD 83)

BASE STATIONS USED

| PID | DESIGNATION | LATITUDE | LONGITUDE | DISTANCE(m) |
|--------|-----------------------------|-------------|--------------|-------------|
| DE6262 | URIL U OF RI COOP CORS ARP | N412920.158 | W0713139.778 | 24755.4 |
| DH5831 | CTGR GROTON CORS ARP | N412007.035 | W0720258.969 | 31030.0 |
| DH5835 | CTMA MANSFIELD CORS ARP | N414352.917 | W0721238.877 | 38776.6 |
| DI0966 | XMTS MTS FOX COOP CORS ARP | N420350.018 | W0711501.669 | 73732.3 |
| DH5833 | CTGU GILFORD CORS ARP | N411721.742 | W0724004.444 | 77141.3 |
| DH5829 | CTEG EAST GRANBY CORS ARP | N415524.347 | W0724155.881 | 84558.6 |
| DI0964 | FMTS MTS FRAM COOP CORS ARP | N421800.171 | W0712630.865 | 88765.9 |
| DI1874 | NYRH RIVERHEAD CORS ARP | N405524.088 | W0724250.560 | 102751.6 |
| DE8093 | HAMP NORTHAMPTON CORS ARP | N421903.873 | W0723822.404 | 109387.5 |

NEAREST NGS PUBLISHED CONTROL POINT

LW1156 4030 N413312. W0714728. 1834.9

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

WST 3

FILE: 0793log1207d.tps 000180699

NGS OPUS-RS SOLUTION REPORT

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USER: jeler@jws.com
RINEX FILE: 0793341p.10o

DATE: December 13, 2010
TIME: 19:13:11 UTC

SOFTWARE: rsgps 1.35.1 RS30.prl 1.65 START: 2010/12/07 15:06:15
EPHEMERIS: igr16132.eph [rapid] STOP: 2010/12/07 15:25:55
NAV FILE: brdc3410.10n OBS USED: 2106 / 2241 : 94%
ANT NAME: TPSHIPER_GD QUALITY IND. 28.64/ 20.69
ARP HEIGHT: 1.8 NORMALIZED RMS: 0.286

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2010.93325)

X: 1490556.044(m) 0.006(m) 1490555.274(m) 0.006(m)
Y: -4548645.551(m) 0.018(m) -4548644.112(m) 0.018(m)
Z: 4201203.243(m) 0.015(m) 4201203.169(m) 0.015(m)

LAT: 41 27 50.72450 0.003(m) 41 27 50.75720 0.003(m)
E LON: 288 8 36.85443 0.007(m) 288 8 36.84221 0.007(m)
W LON: 71 51 23.14557 0.007(m) 71 51 23.15779 0.007(m)
EL HGT: 28.463(m) 0.023(m) 27.210(m) 0.023(m)
ORTHO HGT: 58.895(m) 0.028(m) [NAVD88 (Computed using GEOID09)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 19) SPC (0600 CT)
Northing (Y) [meters] 4594216.665 222836.838
Easting (X) [meters] 261450.504 379449.004
Convergence [degrees] -1.89227640 0.59249049
Point Scale 1.00030037 0.99998387
Combined Factor 1.00029590 0.99997941

US NATIONAL GRID DESIGNATOR: 19TBF6145094216(NAD 83)

BASE STATIONS USED

| PID | DESIGNATION | LATITUDE | LONGITUDE | DISTANCE(m) |
|--------|----------------------------|-------------|--------------|-------------|
| DH5831 | CTGR GROTON CORS ARP | N412007.035 | W0720258.969 | 21584.5 |
| DE6262 | URIL U OF RI COOP CORS ARP | N412920.158 | W0713139.778 | 27594.6 |
| DH5835 | CTMA MANSFIELD CORS ARP | N414352.917 | W0721238.877 | 41881.6 |
| DH5837 | CTPU PUTNAM CORS ARP | N415358.888 | W0715320.889 | 48457.8 |
| DH5833 | CTGU GILFORD CORS ARP | N411721.742 | W0724004.444 | 70601.4 |
| DH7113 | CTNE PAQUETTE CORS ARP | N414024.717 | W0724252.252 | 75255.9 |
| DI0966 | XMTS MTS FOX COOP CORS ARP | N420350.018 | W0711501.669 | 83529.6 |
| DI0876 | ACU5 ACUSHNET 5 CORS ARP | N414436.796 | W0705313.027 | 86572.6 |
| DI1874 | NYRH RIVERHEAD CORS ARP | N405524.088 | W0724250.560 | 93712.0 |

NEAREST NGS PUBLISHED CONTROL POINT

LW3463 NORTH STONINGTON LOT N412841.912 W0715250.297 2565.7

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

WST 4

FILE: 0793log1207a.tps 000180530

NGS OPUS-RS SOLUTION REPORT

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USER: jeler@jws.com
RINEX FILE: 0793341m.10o

DATE: December 13, 2010
TIME: 17:10:12 UTC

SOFTWARE: rsgps 1.35.1 RS23.prl 1.65 START: 2010/12/07 12:41:45
EPHEMERIS: igr16132.eph [rapid] STOP: 2010/12/07 13:03:20
NAV FILE: brdc3410.10n OBS USED: 1710 / 1719 : 99%
ANT NAME: TPSHIPER_GD QUALITY IND. 46.48/ 6.39
ARP HEIGHT: 1.8 NORMALIZED RMS: 0.326

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2010.93298)

X: 1493442.429(m) 0.012(m) 1493441.660(m) 0.012(m)
Y: -4556286.645(m) 0.026(m) -4556285.204(m) 0.026(m)
Z: 4191890.303(m) 0.046(m) 4191890.228(m) 0.046(m)

LAT: 41 21 9.36875 0.018(m) 41 21 9.40138 0.018(m)
E LON: 288 8 52.48911 0.005(m) 288 8 52.47698 0.005(m)
W LON: 71 51 7.51089 0.005(m) 71 51 7.52302 0.005(m)
EL HGT: -11.189(m) 0.051(m) -12.446(m) 0.051(m)
ORTHO HGT: 19.422(m) 0.053(m) [NAVD88 (Computed using GEOID09)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 19) SPC (0600 CT)
Northing (Y) [meters] 4581825.675 210459.418
Easting (X) [meters] 261405.325 379940.459
Convergence [degrees] -1.88523544 0.59537013
Point Scale 1.00030065 0.99998811
Combined Factor 1.00030241 0.99998986

US NATIONAL GRID DESIGNATOR: 19TBF6140581825(NAD 83)

BASE STATIONS USED

| PID | DESIGNATION | LATITUDE | LONGITUDE | DISTANCE(m) |
|--------|---------------------------|-------------|--------------|-------------|
| DH5831 | CTGR GROTON CORS ARP | N412007.035 | W0720258.969 | 16652.1 |
| DH5835 | CTMA MANSFIELD CORS ARP | N414352.917 | W0721238.877 | 51629.0 |
| DH5837 | CTPU PUTNAM CORS ARP | N415358.888 | W0715320.889 | 60841.4 |
| DH5833 | CTGU GILFORD CORS ARP | N411721.742 | W0724004.444 | 68664.0 |
| DH7113 | CTNE PAQUETTE CORS ARP | N414024.717 | W0724252.252 | 80334.4 |
| DI1874 | NYRH RIVERHEAD CORS ARP | N405524.088 | W0724250.560 | 86657.7 |
| DI0876 | ACU5 ACUSHNET 5 CORS ARP | N414436.796 | W0705313.027 | 91484.5 |
| DH5829 | CTEG EAST GRANBY CORS ARP | N415524.347 | W0724155.881 | 94851.2 |
| DJ5206 | MOR5 MORICHES 5 CORS ARP | N404722.259 | W0724446.639 | 97765.0 |

NEAREST NGS PUBLISHED CONTROL POINT

LW3297 FROST 1873 N412057.389 W0715101.607 395.0

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

CT BP11

FILE: 0793log1207b.tps 000180696

NGS OPUS-RS SOLUTION REPORT

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USER: jeler@jws.com
RINEX FILE: 0793341n.10o

DATE: December 13, 2010
TIME: 19:11:19 UTC

SOFTWARE: rsgps 1.35.1 RS40.prl 1.65 START: 2010/12/07 13:18:05
EPHEMERIS: igr16132.eph [rapid] STOP: 2010/12/07 13:40:20
NAV FILE: brdc3410.10n OBS USED: 1863 / 1989 : 94%
ANT NAME: TPSHIPER_GD QUALITY IND. 26.64/ 11.45
ARP HEIGHT: 1.8 NORMALIZED RMS: 0.336

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2010.93305)

X: 1493214.093(m) 0.005(m) 1493213.324(m) 0.005(m)
Y: -4555890.175(m) 0.020(m) -4555888.734(m) 0.020(m)
Z: 4192391.102(m) 0.015(m) 4192391.027(m) 0.015(m)

LAT: 41 21 31.14598 0.005(m) 41 21 31.17861 0.005(m)
E LON: 288 8 48.46700 0.005(m) 288 8 48.45487 0.005(m)
W LON: 71 51 11.53300 0.005(m) 71 51 11.54513 0.005(m)
EL HGT: -16.475(m) 0.025(m) -17.732(m) 0.025(m)
ORTHO HGT: 14.126(m) 0.029(m) [NAVD88 (Computed using GEOID09)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 19) SPC (0600 CT)
Northing (Y) [meters] 4582500.423 211130.235
Easting (X) [meters] 261333.968 379839.995
Convergence [degrees] -1.88620070 0.59462933
Point Scale 1.00030107 0.99998778
Combined Factor 1.00030365 0.99999037

US NATIONAL GRID DESIGNATOR: 19TBF6133382500(NAD 83)

BASE STATIONS USED

| PID | DESIGNATION | LATITUDE | LONGITUDE | DISTANCE(m) |
|--------|---------------------------|-------------|--------------|-------------|
| DH5831 | CTGR GROTON CORS ARP | N412007.035 | W0720258.969 | 16649.8 |
| DH5835 | CTMA MANSFIELD CORS ARP | N414352.917 | W0721238.877 | 51027.7 |
| DH5837 | CTPU PUTNAM CORS ARP | N415358.888 | W0715320.889 | 60165.7 |
| DH5833 | CTGU GILFORD CORS ARP | N411721.742 | W0724004.444 | 68639.8 |
| DH7113 | CTNE PAQUETTE CORS ARP | N414024.717 | W0724252.252 | 79951.7 |
| DI1874 | NYRH RIVERHEAD CORS ARP | N405524.088 | W0724250.560 | 86948.3 |
| DI0876 | ACU5 ACUSHNET 5 CORS ARP | N414436.796 | W0705313.027 | 91246.6 |
| DH5829 | CTEG EAST GRANBY CORS ARP | N415524.347 | W0724155.881 | 94331.4 |
| DJ5206 | MOR5 MORICHES 5 CORS ARP | N404722.259 | W0724446.639 | 98121.6 |

NEAREST NGS PUBLISHED CONTROL POINT

LW3297 FROST 1873 N412057.389 W0715101.607 1068.9

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

CT BP12

FILE: 0793log1207c.tps 000180698

NGS OPUS-RS SOLUTION REPORT

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USER: jeler@jws.com
RINEX FILE: 07933410.10o

DATE: December 13, 2010
TIME: 19:11:57 UTC

SOFTWARE: rsgps 1.35.1 RS23.prl 1.65 START: 2010/12/07 14:09:10
EPHEMERIS: igr16132.eph [rapid] STOP: 2010/12/07 14:29:40
NAV FILE: brdc3410.10n OBS USED: 1968 / 2000 : 98%
ANT NAME: TPSHIPER_GD QUALITY IND. 31.82/ 37.54
ARP HEIGHT: 1.8 NORMALIZED RMS: 0.288

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2010.93314)

X: 1485885.271(m) 0.008(m) 1485884.501(m) 0.008(m)
Y: -4552553.859(m) 0.019(m) -4552552.420(m) 0.019(m)
Z: 4198686.928(m) 0.020(m) 4198686.853(m) 0.020(m)

LAT: 41 26 1.03603 0.007(m) 41 26 1.06868 0.007(m)
E LON: 288 4 33.26052 0.007(m) 288 4 33.24822 0.007(m)
W LON: 71 55 26.73948 0.007(m) 71 55 26.75178 0.007(m)
EL HGT: 58.896(m) 0.027(m) 57.642(m) 0.027(m)
ORTHO HGT: 89.383(m) 0.031(m) [NAVD88 (Computed using GEOID09)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 19) SPC (0600 CT)
Northing (Y) [meters] 4591022.432 219396.837
Easting (X) [meters] 255684.590 373828.831
Convergence [degrees] -1.93598039 0.54762459
Point Scale 1.00033464 0.99998466
Combined Factor 1.00032540 0.99997542

US NATIONAL GRID DESIGNATOR: 19TBF5568491022(NAD 83)

BASE STATIONS USED

| PID | DESIGNATION | LATITUDE | LONGITUDE | DISTANCE(m) |
|--------|-----------------------------|-------------|--------------|-------------|
| DH5831 | CTGR GROTON CORS ARP | N412007.035 | W0720258.969 | 15155.2 |
| DH5835 | CTMA MANSFIELD CORS ARP | N414352.917 | W0721238.877 | 40806.8 |
| DH5833 | CTGU GILFORD CORS ARP | N411721.742 | W0724004.444 | 64265.7 |
| DH7113 | CTNE PAQUETTE CORS ARP | N414024.717 | W0724252.252 | 71122.5 |
| DH5829 | CTEG EAST GRANBY CORS ARP | N415524.347 | W0724155.881 | 84387.1 |
| DI0966 | XMTS MTS FOX COOP CORS ARP | N420350.018 | W0711501.669 | 89664.5 |
| DI0876 | ACU5 ACUSHNET 5 CORS ARP | N414436.796 | W0705313.027 | 93077.3 |
| DI0964 | FMTS MTS FRAM COOP CORS ARP | N421800.171 | W0712630.865 | 104228.3 |

NEAREST NGS PUBLISHED CONTROL POINT

LW3461 JEREMY N412501.339 W0715443.173 2104.2

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

CT BP13

FILE: 0793log1207k.tps 000180706

NGS OPUS-RS SOLUTION REPORT

=====

USER: jeler@jws.com
RINEX FILE: 0793341u.10o

DATE: December 13, 2010
TIME: 19:14:57 UTC

SOFTWARE: rsgps 1.35.1 RS40.prl 1.65 START: 2010/12/07 20:23:30
EPHEMERIS: igr16132.eph [rapid] STOP: 2010/12/07 20:44:35
NAV FILE: brdc3410.10n OBS USED: 1890 / 1980 : 95%
ANT NAME: TPSHIPER_GD QUALITY IND. 12.22/ 27.01
ARP HEIGHT: 1.8 NORMALIZED RMS: 0.294

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2010.93385)

X: 1494687.974(m) 0.007(m) 1494687.204(m) 0.007(m)
Y: -4548344.833(m) 0.014(m) -4548343.393(m) 0.014(m)
Z: 4200020.471(m) 0.009(m) 4200020.397(m) 0.009(m)

LAT: 41 27 0.47587 0.004(m) 41 27 0.50859 0.004(m)
E LON: 288 11 30.05268 0.006(m) 288 11 30.04054 0.006(m)
W LON: 71 48 29.94732 0.006(m) 71 48 29.95946 0.006(m)
EL HGT: -3.201(m) 0.016(m) -4.456(m) 0.016(m)
ORTHO HGT: 27.243(m) 0.022(m) [NAVD88 (Computed using GEOID09)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 19) SPC (0600 CT)
Northing (Y) [meters] 4592535.206 221329.427
Easting (X) [meters] 265418.446 383484.876
Convergence [degrees] -1.85986309 0.62439069
Point Scale 1.00027726 0.99998420
Combined Factor 1.00027776 0.99998470

US NATIONAL GRID DESIGNATOR: 19TBF6541892535(NAD 83)

BASE STATIONS USED

| PID | DESIGNATION | LATITUDE | LONGITUDE | DISTANCE(m) |
|--------|-----------------------------|-------------|--------------|-------------|
| DE6262 | URIL U OF RI COOP CORS ARP | N412920.158 | W0713139.778 | 23833.1 |
| DH5835 | CTMA MANSFIELD CORS ARP | N414352.917 | W0721238.877 | 45845.7 |
| DH5837 | CTPU PUTNAM CORS ARP | N415358.888 | W0715320.889 | 50382.8 |
| DH5833 | CTGU GILFORD CORS ARP | N411721.742 | W0724004.444 | 74097.7 |
| DH7113 | CTNE PAQUETTE CORS ARP | N414024.717 | W0724252.252 | 79559.1 |
| DI0876 | ACU5 ACUSHNET 5 CORS ARP | N414436.796 | W0705313.027 | 83441.8 |
| DH5829 | CTEG EAST GRANBY CORS ARP | N415524.347 | W0724155.881 | 90885.7 |
| DI1874 | NYRH RIVERHEAD CORS ARP | N405524.088 | W0724250.560 | 95897.3 |
| DI0964 | FMTS MTS FRAM COOP CORS ARP | N421800.171 | W0712630.865 | 99179.2 |

NEAREST NGS PUBLISHED CONTROL POINT

LW0955 E 19 N412635. W0714745. 1306.1

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

CT BP14

FILE: 0793log1207e.tps 000180700

NGS OPUS-RS SOLUTION REPORT

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USER: jeler@jws.com
RINEX FILE: 0793341q.10o

DATE: December 13, 2010
TIME: 19:10:31 UTC

SOFTWARE: rsgps 1.35.1 RS29.prl 1.65 START: 2010/12/07 16:01:35
EPHEMERIS: igr16132.eph [rapid] STOP: 2010/12/07 16:22:00
NAV FILE: brdc3410.10n OBS USED: 1440 / 2043 : 70%
ANT NAME: TPSHIPER_GD QUALITY IND. 19.93/ 21.16
ARP HEIGHT: 1.8 NORMALIZED RMS: 0.241

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2010.93336)

X: 1486012.436(m) 0.006(m) 1486011.666(m) 0.006(m)
Y: -4547541.629(m) 0.010(m) -4547540.190(m) 0.010(m)
Z: 4204053.315(m) 0.009(m) 4204053.241(m) 0.009(m)

LAT: 41 29 52.79893 0.004(m) 41 29 52.83164 0.004(m)
E LON: 288 5 45.52238 0.006(m) 288 5 45.51009 0.006(m)
W LON: 71 54 14.47762 0.006(m) 71 54 14.48991 0.006(m)
EL HGT: 71.609(m) 0.013(m) 70.356(m) 0.013(m)
ORTHO HGT: 101.982(m) 0.020(m) [NAVD88 (Computed using GEOID09)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 19) SPC (0600 CT)
Northing (Y) [meters] 4598114.287 226562.682
Easting (X) [meters] 257602.019 375436.436
Convergence [degrees] -1.92512212 0.56093400
Point Scale 1.00032314 0.99998333
Combined Factor 1.00031191 0.99997210

US NATIONAL GRID DESIGNATOR: 19TBF5760298114(NAD 83)

BASE STATIONS USED

| PID | DESIGNATION | LATITUDE | LONGITUDE | DISTANCE(m) |
|--------|-----------------------------|-------------|--------------|-------------|
| DH5831 | CTGR GROTON CORS ARP | N412007.035 | W0720258.969 | 21793.0 |
| DE6262 | URIL U OF RI COOP CORS ARP | N412920.158 | W0713139.778 | 31439.6 |
| DH5835 | CTMA MANSFIELD CORS ARP | N414352.917 | W0721238.877 | 36409.0 |
| DH5837 | CTPU PUTNAM CORS ARP | N415358.888 | W0715320.889 | 44632.4 |
| DH5833 | CTGU GILFORD CORS ARP | N411721.742 | W0724004.444 | 67957.0 |
| DH5829 | CTEG EAST GRANBY CORS ARP | N415524.347 | W0724155.881 | 81292.4 |
| DI0876 | ACU5 ACUSHNET 5 CORS ARP | N414436.796 | W0705313.027 | 89042.1 |
| DI1874 | NYRH RIVERHEAD CORS ARP | N405524.088 | W0724250.560 | 93207.3 |
| DI0964 | FMTS MTS FRAM COOP CORS ARP | N421800.171 | W0712630.865 | 96986.9 |

NEAREST NGS PUBLISHED CONTROL POINT

LW1839 L 89 N413018. W0715325. 1385.7

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

CT BP15

FILE: 0793log1207f.tps 000180756

NGS OPUS-RS SOLUTION REPORT

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USER: jeler@jws.com
RINEX FILE: 0793341q.10o

DATE: December 13, 2010
TIME: 19:44:01 UTC

SOFTWARE: rsgps 1.35.1 RS40.prl 1.65 START: 2010/12/07 16:46:50
EPHEMERIS: igr16132.eph [rapid] STOP: 2010/12/07 17:06:50
NAV FILE: brdc3410.10n OBS USED: 784 / 1728 : 45%
ANT NAME: TPSHIPER_GD QUALITY IND. 27.62/ 6.40
ARP HEIGHT: 1.8 NORMALIZED RMS: 0.337

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2010.93344)

X: 1491960.528(m) 0.008(m) 1491959.758(m) 0.008(m)
Y: -4541059.981(m) 0.021(m) -4541058.543(m) 0.021(m)
Z: 4208997.330(m) 0.014(m) 4208997.257(m) 0.014(m)

LAT: 41 33 25.33138 0.017(m) 41 33 25.36415 0.017(m)
E LON: 288 11 16.38135 0.006(m) 288 11 16.36915 0.006(m)
W LON: 71 48 43.61865 0.006(m) 71 48 43.63085 0.006(m)
EL HGT: 124.736(m) 0.019(m) 123.485(m) 0.019(m)
ORTHO HGT: 155.044(m) 0.024(m) [NAVD88 (Computed using GEOID09)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 19) SPC (0600 CT)
Northing (Y) [meters] 4604415.712 233198.263
Easting (X) [meters] 265487.578 383038.709
Convergence [degrees] -1.86630887 0.62187266
Point Scale 1.00027684 0.99998322
Combined Factor 1.00025727 0.99996366

US NATIONAL GRID DESIGNATOR: 19TBG6548704415(NAD 83)

BASE STATIONS USED

| PID | DESIGNATION | LATITUDE | LONGITUDE | DISTANCE(m) |
|--------|-----------------------------|-------------|--------------|-------------|
| DE6262 | URIL U OF RI COOP CORS ARP | N412920.158 | W0713139.778 | 24914.3 |
| DH5831 | CTGR GROTON CORS ARP | N412007.035 | W0720258.969 | 31635.2 |
| DH5835 | CTMA MANSFIELD CORS ARP | N414352.917 | W0721238.877 | 38446.6 |
| DI0966 | XMTS MTS FOX COOP CORS ARP | N420350.018 | W0711501.669 | 73126.9 |
| DH7113 | CTNE PAQUETTE CORS ARP | N414024.717 | W0724252.252 | 76318.0 |
| DH5829 | CTEG EAST GRANBY CORS ARP | N415524.347 | W0724155.881 | 84245.6 |
| DI0964 | FMTS MTS FRAM COOP CORS ARP | N421800.171 | W0712630.865 | 88055.3 |
| DI1874 | NYRH RIVERHEAD CORS ARP | N405524.088 | W0724250.560 | 103290.7 |

NEAREST NGS PUBLISHED CONTROL POINT

LW1156 4030 N413312. W0714728. 1797.7

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

CT BP16

FILE: 0793log1207i.tps 000180757

NGS OPUS-RS SOLUTION REPORT
=====

USER: jeler@jws.com
RINEX FILE: 0793341s.10o

DATE: December 13, 2010
TIME: 19:42:56 UTC

SOFTWARE: rsgps 1.35.1 RS11.prl 1.65 START: 2010/12/07 18:43:00
EPHEMERIS: igr16132.eph [rapid] STOP: 2010/12/07 19:03:45
NAV FILE: brdc3410.10n OBS USED: 1935 / 2250 : 86%
ANT NAME: TPSHIPER_GD QUALITY IND. 32.40/ 29.36
ARP HEIGHT: 1.8 NORMALIZED RMS: 0.317

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2010.93366)

X: 1489355.830(m) 0.010(m) 1489355.059(m) 0.010(m)
Y: -4535702.538(m) 0.019(m) -4535701.100(m) 0.019(m)
Z: 4215651.324(m) 0.016(m) 4215651.252(m) 0.016(m)

LAT: 41 38 13.63616 0.007(m) 41 38 13.66902 0.007(m)
E LON: 288 10 41.71610 0.010(m) 288 10 41.70384 0.010(m)
W LON: 71 49 18.28390 0.010(m) 71 49 18.29616 0.010(m)
EL HGT: 127.999(m) 0.024(m) 126.750(m) 0.024(m)
ORTHO HGT: 158.196(m) 0.028(m) [NAVD88 (Computed using GEOID09)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 19) SPC (0600 CT)
Northing (Y) [meters] 4613334.302 242083.572
Easting (X) [meters] 264975.462 382139.925
Convergence [degrees] -1.87565402 0.61548791
Point Scale 1.00027979 0.99998477
Combined Factor 1.00025971 0.99996469

US NATIONAL GRID DESIGNATOR: 19TBG6497513334(NAD 83)

BASE STATIONS USED

| PID | DESIGNATION | LATITUDE | LONGITUDE | DISTANCE(m) |
|--------|----------------------------|-------------|--------------|-------------|
| DE6262 | URIL U OF RI COOP CORS ARP | N412920.158 | W0713139.778 | 29537.4 |
| DH5835 | CTMA MANSFIELD CORS ARP | N414352.917 | W0721238.877 | 34042.0 |
| DI0966 | XMTS MTS FOX COOP CORS ARP | N420350.018 | W0711501.669 | 67065.0 |
| DH7113 | CTNE PAQUETTE CORS ARP | N414024.717 | W0724252.252 | 74474.6 |
| DI0876 | ACU5 ACUSHNET 5 CORS ARP | N414436.796 | W0705313.027 | 78715.4 |
| DE8093 | HAMP NORTHAMPTON CORS ARP | N421903.873 | W0723822.404 | 101534.0 |
| DH5839 | CTWI WINCHESTER CORS ARP | N415351.907 | W0730410.968 | 107733.0 |
| DJ5206 | MOR5 MORICHES 5 CORS ARP | N404722.259 | W0724446.639 | 121951.6 |
| DH5825 | CTBR BROOKFIELD CORS ARP | N412949.864 | W0732505.674 | 134065.0 |

NEAREST NGS PUBLISHED CONTROL POINT

LW1815 D 89 N413836. W0715050. 2229.4

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

CT BP17

FILE: 0793log1207j.tps 000180705

NGS OPUS-RS SOLUTION REPORT
=====

USER: jeler@jws.com
RINEX FILE: 0793341t.10o

DATE: December 13, 2010
TIME: 19:13:17 UTC

SOFTWARE: rsgps 1.35.1 RS10.prl 1.65 START: 2010/12/07 19:47:25
EPHEMERIS: igr16132.eph [rapid] STOP: 2010/12/07 20:08:15
NAV FILE: brdc3410.10n OBS USED: 2016 / 2295 : 88%
ANT NAME: TPSHIPER_GD QUALITY IND. 31.68/ 4.89
ARP HEIGHT: 1.8 NORMALIZED RMS: 0.316

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2010.93379)

X: 1490981.836(m) 0.012(m) 1490981.066(m) 0.012(m)
Y: -4545362.603(m) 0.015(m) -4545361.164(m) 0.015(m)
Z: 4204713.225(m) 0.017(m) 4204713.151(m) 0.017(m)

LAT: 41 30 20.08736 0.007(m) 41 30 20.12009 0.007(m)
E LON: 288 9 38.38169 0.010(m) 288 9 38.36948 0.010(m)
W LON: 71 50 21.61831 0.010(m) 71 50 21.63052 0.010(m)
EL HGT: 115.962(m) 0.023(m) 114.709(m) 0.023(m)
ORTHO HGT: 146.330(m) 0.027(m) [NAVD88 (Computed using GEOID09)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 19) SPC (0600 CT)
Northing (Y) [meters] 4598776.484 227459.393
Easting (X) [meters] 263029.318 380828.155
Convergence [degrees] -1.88248360 0.60382277
Point Scale 1.00029112 0.99998326
Combined Factor 1.00027292 0.99996507

US NATIONAL GRID DESIGNATOR: 19TBF6302998776(NAD 83)

BASE STATIONS USED

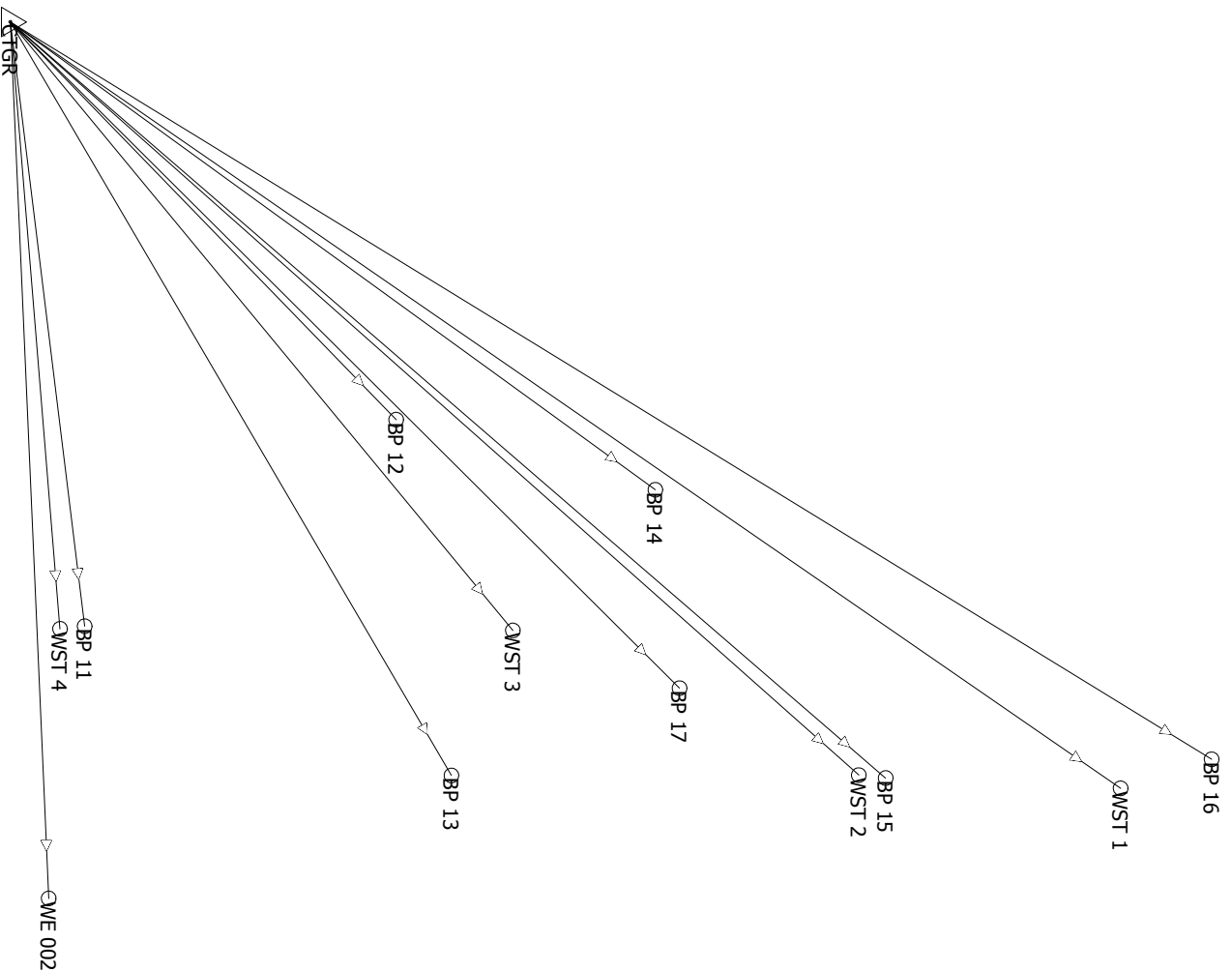
| PID | DESIGNATION | LATITUDE | LONGITUDE | DISTANCE(m) |
|--------|-----------------------------|-------------|--------------|-------------|
| DH5835 | CTMA MANSFIELD CORS ARP | N414352.917 | W0721238.877 | 39841.6 |
| DH5837 | CTPU PUTNAM CORS ARP | N415358.888 | W0715320.889 | 43969.3 |
| DH5833 | CTGU GILFORD CORS ARP | N411721.742 | W0724004.444 | 73333.4 |
| DI0966 | XMTS MTS FOX COOP CORS ARP | N420350.018 | W0711501.669 | 79005.2 |
| DI0876 | ACU5 ACUSHNET 5 CORS ARP | N414436.796 | W0705313.027 | 83653.0 |
| DI0964 | FMTS MTS FRAM COOP CORS ARP | N421800.171 | W0712630.865 | 94203.5 |
| DI1874 | NYRH RIVERHEAD CORS ARP | N405524.088 | W0724250.560 | 97783.7 |
| DJ5206 | MOR5 MORICHES 5 CORS ARP | N404722.259 | W0724446.639 | 110092.2 |
| DH5825 | CTBR BROOKFIELD CORS ARP | N412949.864 | W0732505.674 | 131830.6 |

NEAREST NGS PUBLISHED CONTROL POINT

LW3558 NORTH STONINGTON CONG CH SPIRE N413019.886 W0715023.800 50.9

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

Field surveyor:
Dan Livingstone/Eric Jellerson
Computer operator:
Paul Messier
Reference:
NE LIDAR



Site: Not selected, System: UTM
Zone: 19 North, Datum: NAD 1983 (Connus)

Project: 75980S PhotoSci SE Connecticut
Metric Template



0'00'00"

Plot Scale: 1:200000

Printed on 3/22/2011, at 11:16:47 AM

Printed from Trimble Geomatics Office

Baseline Processing Report

Project : 75980S PhotoSci SE Connecticut

| | | | |
|--------------------------|------------------|------------------------|----------------------|
| User name | mesp | Date & Time | 1:39:21 PM 3/22/2011 |
| Coordinate System | UTM | Zone | 19 North |
| Project Datum | NAD 1983 (Conus) | | |
| Vertical Datum | NAVD88 | Geoid Model | GEIOD09(Conus) |
| Coordinate Units | Meters | | |
| Distance Units | Meters | | |
| Height Units | Meters | | |

Processing Summary

| ID | From | To | Baseline Length | Solution Type | Ratio | Reference Variance | RMS |
|---------------------|------|--------|-----------------|-----------------|-------|--------------------|--------|
| B21 | CTGR | WST 3 | 21584.494m | lono free fixed | 21.1 | 0.468 | 0.009m |
| B20 | CTGR | WST 2 | 31029.973m | lono free fixed | 29.4 | 1.034 | 0.011m |
| B19 | CTGR | WST 1 | 36899.265m | lono free fixed | 15.6 | 1.017 | 0.013m |
| B18 | CTGR | WE 002 | 23992.700m | lono free fixed | 48.7 | 0.480 | 0.009m |
| B15 | CTGR | BP 17 | 25826.926m | lono free fixed | 12.6 | 1.079 | 0.014m |
| B13 | CTGR | BP 16 | 38552.181m | lono free fixed | 13.6 | 1.057 | 0.013m |
| B11 | CTGR | BP 15 | 31635.207m | lono free fixed | 10.6 | 2.300 | 0.020m |
| B9 | CTGR | BP 14 | 21793.045m | lono free fixed | 26.7 | 0.350 | 0.008m |
| B7 | CTGR | BP 13 | 23880.313m | lono free fixed | 26.0 | 0.971 | 0.012m |
| B5 | CTGR | BP 12 | 15155.225m | lono free fixed | 48.1 | 0.515 | 0.009m |
| B3 | CTGR | BP 11 | 16649.808m | lono free fixed | 22.4 | 1.173 | 0.012m |
| B1 | CTGR | WST 4 | 16652.054m | lono free fixed | 5.7 | 1.915 | 0.016m |

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Network Adjustment Report

Project : 75980S PhotoSci SE Connecticut

| | | | |
|--------------------------|------------------|------------------------|----------------------|
| User name | mesp | Date & Time | 2:29:26 PM 3/22/2011 |
| Coordinate System | UTM | Zone | 19 North |
| Project Datum | NAD 1983 (Conus) | | |
| Vertical Datum | NAVD88 | Geoid Model | GEIOD09(Conus) |
| Coordinate Units | Meters | | |
| Distance Units | Meters | | |
| Height Units | Meters | | |

Adjustment Style Settings - 95% Confidence Limits

Residual Tolerances

To End Iterations : 0.000010m
Final Convergence Cutoff : 0.005000m

Covariance Display

Horizontal

Propagated Linear Error [E] : U.S.
Constant Term [C] : 0.00000000m
Scale on Linear Error [S] : 1.96

Three-Dimensional

Propagated Linear Error [E] : U.S.
Constant Term [C] : 0.00000000m
Scale on Linear Error [S] : 1.96
Elevation Errors were used in the calculations.

Adjustment Controls

Compute Correlations for Geoid : True
Horizontal and Vertical adjustment performed

Set-up Errors

GPS

Error in Height of Antenna : 0.003m
Centering Error : 0.002m

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Statistical Summary

Successful Adjustment in 1 iteration(s)

Network Reference Factor : 1.00

Chi Square Test ($\alpha=95\%$) : PASS

Degrees of Freedom : 0.00

GPS Observation Statistics

Reference Factor : 1.00

Redundancy Number (r) : 0.00

Individual GPS Observation Statistics

| Observation ID | Reference Factor | Redundancy Number |
|----------------|------------------|-------------------|
| B1 | 1.00 | 0.00 |
| B3 | 1.00 | 0.00 |
| B5 | 1.00 | 0.00 |
| B7 | 1.00 | 0.00 |
| B9 | 1.00 | 0.00 |
| B11 | 1.00 | 0.00 |
| B13 | 1.00 | 0.00 |
| B15 | 1.00 | 0.00 |
| B18 | 1.00 | 0.00 |
| B19 | 1.00 | 0.00 |
| B20 | 1.00 | 0.00 |
| B21 | 1.00 | 0.00 |

Geoid Model Statistics

Reference Factor : 1.00

Redundancy Number (r) : 0.00

Weighting Strategies

GPS Observations

Default Scalar Applied to All Observations

Scalar : 1.00

Geoid Observations

Default Scalar Applied to All Observations

Scalar : 1.00

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Adjusted Coordinates

Adjustment performed in **NAD 1983 (Conus)**

Number of Points : 13

Number of Constrained Points : 2

Horizontal Only : 1

Horizontal and Elevation Only : 1

Adjusted Grid CoordinatesErrors are reported using 1.96σ .

| Point Name | Northing | N error | Easting | E error | Elevation | e error | Fix |
|------------|--------------|---------|-------------|---------|-----------|---------|-------|
| CTGR | 4580466.244m | 0.000m | 244802.965m | 0.000m | 12.285m | 0.394m | N E |
| WST 4 | 4581825.644m | 0.012m | 261405.344m | 0.007m | 19.469m | 0.395m | |
| BP 11 | 4582500.406m | 0.009m | 261333.987m | 0.007m | 14.200m | 0.395m | |
| BP 12 | 4591022.399m | 0.007m | 255684.614m | 0.006m | 89.470m | 0.394m | |
| BP 13 | 4592535.181m | 0.008m | 265418.471m | 0.008m | 27.302m | 0.394m | |
| BP 14 | 4598114.272m | 0.007m | 257602.050m | 0.007m | 102.027m | 0.394m | |
| BP 15 | 4604415.669m | 0.012m | 265487.604m | 0.011m | 155.113m | 0.395m | |
| BP 16 | 4613334.289m | 0.013m | 264975.501m | 0.011m | 158.246m | 0.394m | |
| BP 17 | 4598776.450m | 0.010m | 263029.342m | 0.008m | 146.327m | 0.394m | |
| WE 002 | 4581516.523m | 0.000m | 268780.629m | 0.000m | 22.173m | 0.000m | N E e |
| WST 1 | 4610845.010m | 0.011m | 265769.333m | 0.010m | 107.652m | 0.394m | |
| WST 2 | 4603680.925m | 0.010m | 265407.798m | 0.009m | 147.706m | 0.395m | |
| WST 3 | 4594216.650m | 0.008m | 261450.522m | 0.007m | 58.914m | 0.394m | |

Adjusted Geodetic CoordinatesErrors are reported using 1.96σ .

| Point Name | Latitude | N error | Longitude | E error | Height | h error | Fix |
|------------|----------------------|---------|----------------------|---------|----------|---------|-------------|
| CTGR | 41° 20'07.03566"N | 0.000m | 72° 02'58.96958"W | 0.000m | -18.357m | 0.279m | Lat Long |
| WST 4 | 41° 21'09.36778"N | 0.012m | 71° 51'07.51003"W | 0.007m | -11.142m | 0.280m | |
| BP 11 | 41° 21'31.14547"N | 0.009m | 71° 51'11.53218"W | 0.007m | -16.400m | 0.280m | |
| BP 12 | 41° 26'01.03498"N | 0.007m | 71° 55'26.73839"W | 0.006m | 58.983m | 0.279m | |
| BP 13 | 41° 27'00.47509"N | 0.008m | 71° 48'29.94620"W | 0.008m | -3.142m | 0.279m | |
| BP 14 | 41° 29'52.79846"N | 0.007m | 71° 54'14.47625"W | 0.007m | 71.654m | 0.279m | |
| BP 15 | 41° 33'25.33003"N | 0.012m | 71° 48'43.61749"W | 0.011m | 124.805m | 0.280m | |
| BP 16 | 41° 38'13.63580"N | 0.013m | 71° 49'18.28218"W | 0.011m | 128.049m | 0.279m | |

| | | | | | | | |
|--------|----------------------|--------|----------------------|--------|----------|--------|---------------|
| BP 17 | 41° 30'20.08628"N | 0.010m | 71° 50'21.61721"W | 0.008m | 115.960m | 0.279m | Lat Long e |
| WE 002 | 41° 21'07.09667"N | 0.000m | 71° 45'50.06333"W | 0.000m | -8.404m | 0.279m | |
| WST 1 | 41° 36'53.85601"N | 0.011m | 71° 48'40.50535"W | 0.010m | 77.424m | 0.279m | |
| WST 2 | 41° 33'01.44935"N | 0.010m | 71° 48'46.02609"W | 0.009m | 117.391m | 0.279m | |
| WST 3 | 41° 27'50.72402"N | 0.008m | 71° 51'23.14474"W | 0.007m | 28.482m | 0.279m | |

Coordinate Deltas

| Point Name | ΔNorthing | ΔEasting | ΔElevation | ΔHeight | ΔGeoid Separation |
|------------|-----------|----------|------------|---------|-------------------|
| CTGR | 0.000m | 0.000m | -0.011m | -0.011m | 0.000m |
| WST 4 | -0.011m | 0.007m | -0.011m | -0.011m | 0.000m |
| BP 11 | -0.011m | 0.008m | -0.011m | -0.011m | 0.000m |
| BP 12 | -0.003m | 0.011m | -0.011m | -0.011m | 0.000m |
| BP 13 | -0.010m | 0.016m | -0.011m | -0.011m | 0.000m |
| BP 14 | -0.002m | 0.017m | -0.011m | -0.011m | 0.000m |
| BP 15 | -0.005m | 0.024m | -0.011m | -0.011m | 0.000m |
| BP 16 | -0.001m | 0.030m | -0.011m | -0.011m | 0.000m |
| BP 17 | -0.006m | 0.019m | -0.011m | -0.011m | 0.000m |
| WE 002 | 0.000m | 0.000m | 0.000m | -0.011m | 0.011m |
| WST 1 | -0.003m | 0.029m | -0.011m | -0.011m | 0.000m |
| WST 2 | -0.005m | 0.024m | -0.011m | -0.011m | 0.000m |
| WST 3 | -0.006m | 0.016m | -0.011m | -0.011m | 0.000m |

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Control Coordinate Comparisons

Values shown are control coord minus adjusted coord.

| Point Name | ΔNorthing | ΔEasting | ΔElevation | ΔHeight |
|------------|-----------|----------|------------|---------|
| CTGR | N/A | N/A | N/A | 0.011m |
| WE 002 | N/A | N/A | N/A | N/A |

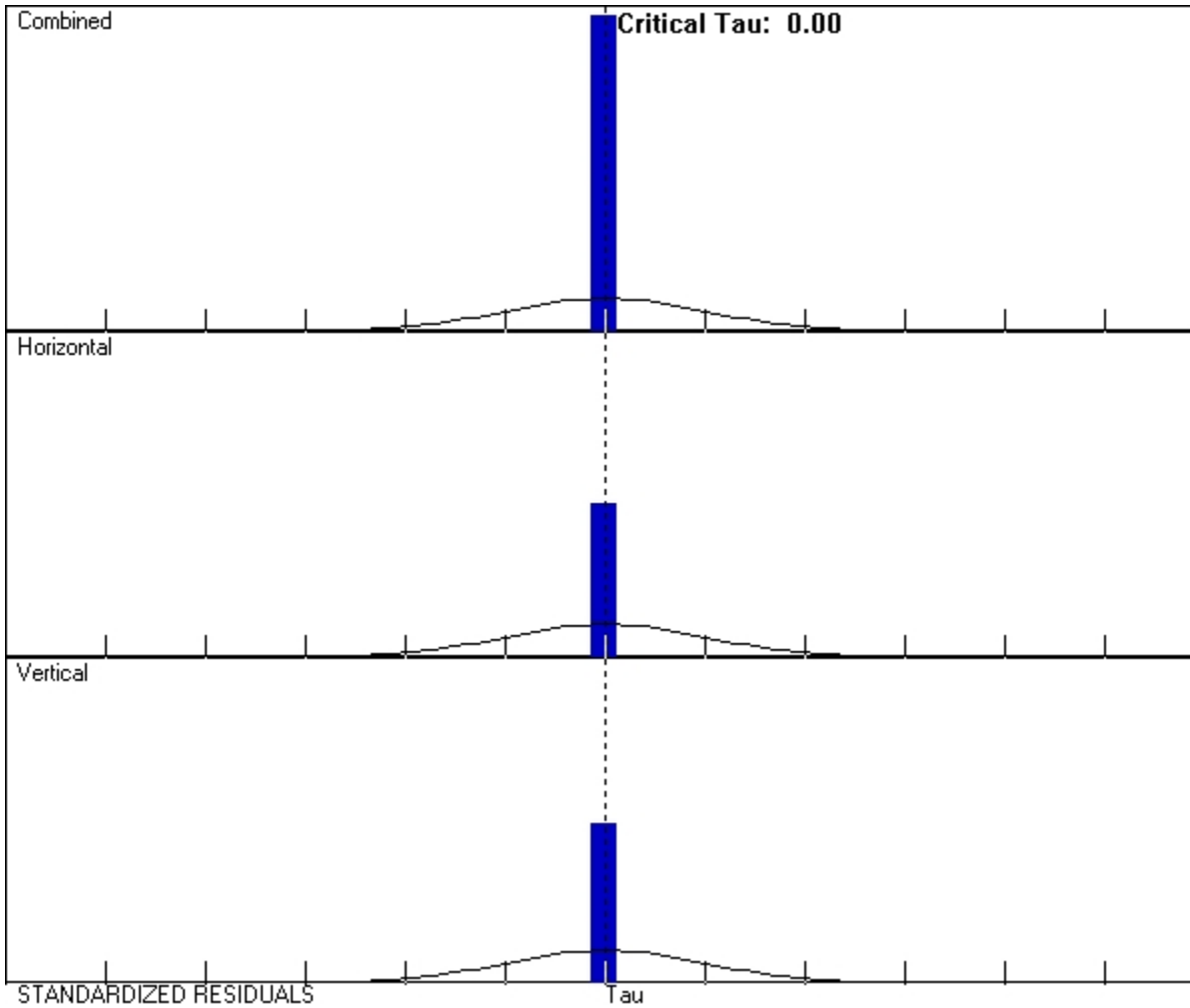
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Adjusted Observations

| | | | | | |
|-----|-------|----------|--------|--------|------|
| G12 | WST 2 | -30.315m | 0.279m | 0.000m | 0.00 |
| G13 | WST 3 | -30.432m | 0.279m | 0.000m | 0.00 |

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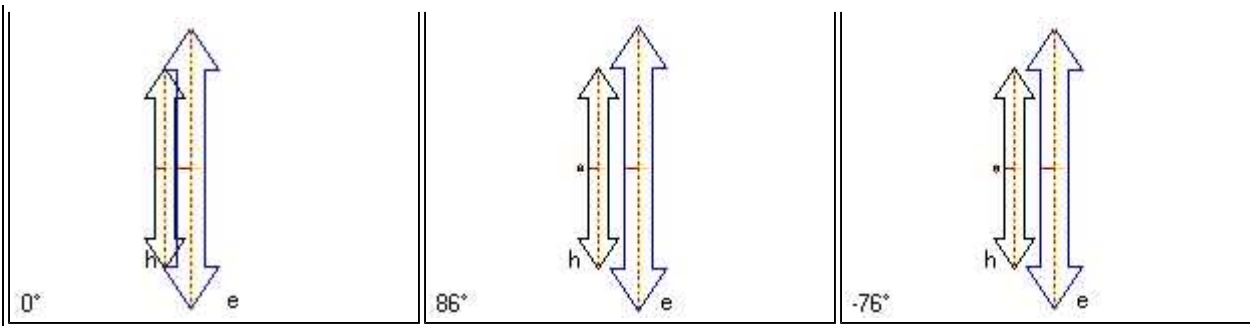
Histograms of Standardized Residuals



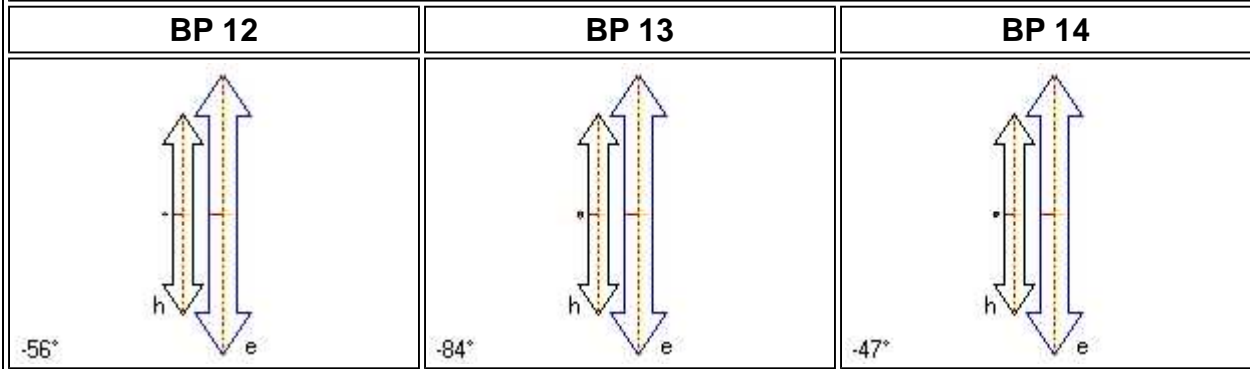
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Point Error Ellipses

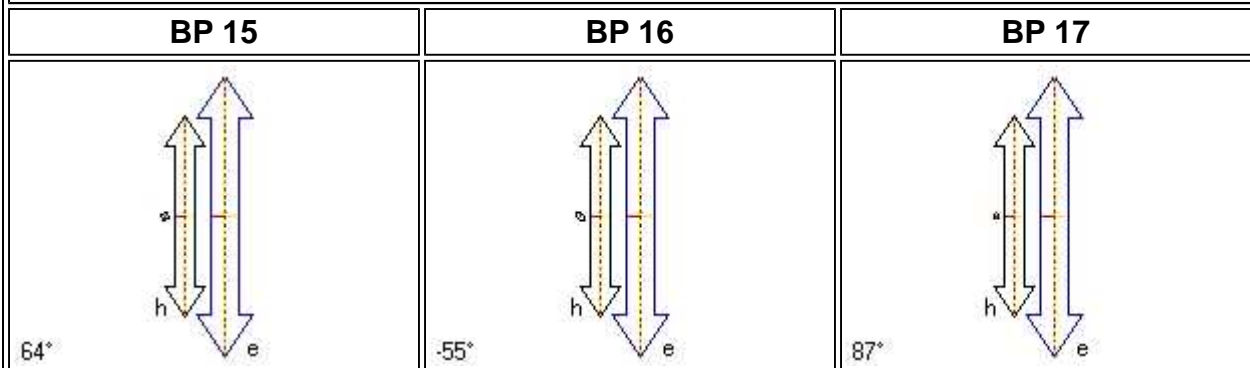
| CTGR | WST 4 | BP 11 |
|------|-------|-------|
| | | |



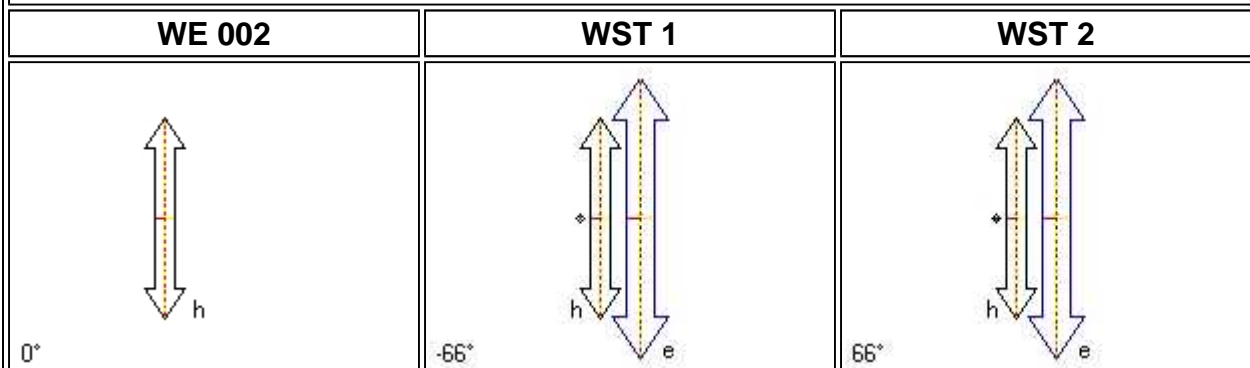
Tick Size: 0.0100m Horizontal Bivariate Scalar: 2.45σ Vertical Univariate Scalar: 1.96σ



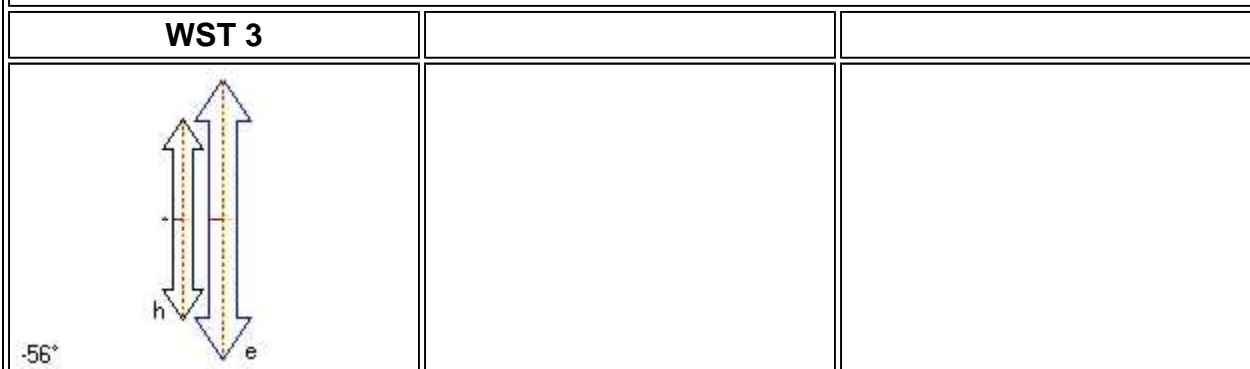
Tick Size: 0.0100m Horizontal Bivariate Scalar: 2.45σ Vertical Univariate Scalar: 1.96σ



Tick Size: 0.0100m Horizontal Bivariate Scalar: 2.45σ Vertical Univariate Scalar: 1.96σ



Tick Size: 0.0100m Horizontal Bivariate Scalar: 2.45σ Vertical Univariate Scalar: 1.96σ



Tick Size: 0.0100m Horizontal Bivariate Scalar: 2.45 σ Vertical Univariate Scalar: 1.96 σ [Back to top](#)

Covariant Terms

Adjustment performed in **NAD 1983 (Conus)**

| From Point | To Point | Components | A-posteriori Error (1.96 σ) | Horiz. Precision (Ratio) | 3D Precision (Ratio) | |
|------------|----------|----------------|-------------------------------------|--------------------------|----------------------|-----------|
| CTGR | WST 4 | Az. | 83° 18'12.6859" | 0°00'00.1456" | 1:2250127 | 1:2250127 |
| | | Δ Ht. | 7.215m | 0.023m | | |
| | | Δ Elev. | 7.184m | 0.558m | | |
| | | Dist. | 16652.102m | 0.007m | | |
| CTGR | BP 11 | Az. | 80° 58'09.4130" | 0°00'00.1151" | 1:2352803 | 1:2352803 |
| | | Δ Ht. | 1.957m | 0.022m | | |
| | | Δ Elev. | 1.915m | 0.558m | | |
| | | Dist. | 16649.864m | 0.007m | | |
| CTGR | BP 12 | Az. | 43° 51'09.6576" | 0°00'00.0935" | 1:2611382 | 1:2611382 |
| | | Δ Ht. | 77.340m | 0.012m | | |
| | | Δ Elev. | 77.185m | 0.558m | | |
| | | Dist. | 15154.988m | 0.006m | | |
| CTGR | BP 13 | Az. | 57° 38'11.7147" | 0°00'00.0700" | 1:3074598 | 1:3074598 |
| | | Δ Ht. | 15.215m | 0.015m | | |
| | | Δ Elev. | 15.016m | 0.558m | | |
| | | Dist. | 23880.371m | 0.008m | | |
| CTGR | BP 14 | Az. | 33° 55'57.9110" | 0°00'00.0741" | 1:3284639 | 1:3284639 |
| | | Δ Ht. | 90.011m | 0.012m | | |
| | | Δ Elev. | 89.742m | 0.558m | | |
| | | Dist. | 21792.786m | 0.007m | | |
| CTGR | BP 15 | Az. | 38° 47'49.2412" | 0°00'00.0701" | 1:2644895 | 1:2644895 |
| | | Δ Ht. | 143.163m | 0.021m | | |
| | | Δ Elev. | 142.828m | 0.558m | | |

| | | | | | | |
|------|--------|---------------|--------------------|---------------|-----------|-----------|
| | | Dist. | 31634.663m | 0.012m | | |
| CTGR | BP 16 | Az. | 29° 31'05.3982" | 0°00'00.0704" | 1:3605254 | 1:3605254 |
| | | ΔHt. | 146.406m | 0.013m | | |
| | | ΔElev. | 145.961m | 0.558m | | |
| | | Dist. | 38551.644m | 0.011m | | |
| CTGR | BP 17 | Az. | 42° 51'00.0558" | 0°00'00.0735" | 1:2706080 | 1:2706080 |
| | | ΔHt. | 134.317m | 0.014m | | |
| | | ΔElev. | 134.042m | 0.558m | | |
| | | Dist. | 25826.406m | 0.010m | | |
| CTGR | WE 002 | Az. | 85° 28'35.1043" | 0°00'00.0000" | 1:0 | 1:0 |
| | | ΔHt. | 9.953m | 0.014m | | |
| | | ΔElev. | 9.888m | 0.394m | | |
| | | Dist. | 23992.771m | 0.000m | | |
| CTGR | WST 1 | Az. | 32° 35'29.2622" | 0°00'00.0600" | 1:3539746 | 1:3539746 |
| | | ΔHt. | 95.781m | 0.014m | | |
| | | ΔElev. | 95.367m | 0.558m | | |
| | | Dist. | 36899.035m | 0.010m | | |
| CTGR | WST 2 | Az. | 39° 34'19.8149" | 0°00'00.0616" | 1:3131729 | 1:3131729 |
| | | ΔHt. | 135.748m | 0.017m | | |
| | | ΔElev. | 135.421m | 0.558m | | |
| | | Dist. | 31029.477m | 0.010m | | |
| CTGR | WST 3 | Az. | 48° 25'35.5355" | 0°00'00.0753" | 1:3226076 | 1:3226076 |
| | | ΔHt. | 46.839m | 0.011m | | |
| | | ΔElev. | 46.628m | 0.558m | | |
| | | Dist. | 21584.445m | 0.007m | | |

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3.0 Published Control Locations

WE 002

FILE: 0793log1207l.tps 000180707

NGS OPUS-RS SOLUTION REPORT

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USER: jeler@jws.com
RINEX FILE: 0793341v.10o

DATE: December 13, 2010
TIME: 19:14:35 UTC

SOFTWARE: rsgps 1.35.1 RS41.prl 1.65 START: 2010/12/07 21:09:15
EPHEMERIS: igr16132.eph [rapid] STOP: 2010/12/07 21:29:35
NAV FILE: brdc3410.10n OBS USED: 1737 / 1971 : 88%
ANT NAME: TPSHIPER_GD QUALITY IND. 26.52/ 27.74
ARP HEIGHT: 1.8 NORMALIZED RMS: 0.279

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2010.93394)

X: 1500468.020(m) 0.013(m) 1500467.251(m) 0.013(m)
Y: -4554028.725(m) 0.029(m) -4554027.284(m) 0.029(m)
Z: 4191839.517(m) 0.022(m) 4191839.442(m) 0.022(m)

LAT: 41 21 7.09761 0.007(m) 41 21 7.13025 0.007(m)
E LON: 288 14 9.93554 0.008(m) 288 14 9.92351 0.008(m)
W LON: 71 45 50.06446 0.008(m) 71 45 50.07649 0.008(m)
EL HGT: -8.451(m) 0.037(m) -9.708(m) 0.037(m)
ORTHO HGT: 22.126(m) 0.041(m) [NAVD88 (Computed using GEOID09)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 19) SPC (3800 RI)
Northing (Y) [meters] 4581516.553 29867.873
Easting (X) [meters] 268780.604 77914.818
Convergence [degrees] -1.82687335 -0.17435940
Point Scale 1.00025800 0.99999975
Combined Factor 1.00025932 1.00000108

US NATIONAL GRID DESIGNATOR: 19TBF6878081516(NAD 83)

BASE STATIONS USED

| PID | DESIGNATION | LATITUDE | LONGITUDE | DISTANCE(m) |
|--------|----------------------------|-------------|--------------|-------------|
| DH5831 | CTGR GROTON CORS ARP | N412007.035 | W0720258.969 | 23992.7 |
| DH5835 | CTMA MANSFIELD CORS ARP | N414352.917 | W0721238.877 | 56267.8 |
| DH5837 | CTPU PUTNAM CORS ARP | N415358.888 | W0715320.889 | 61721.7 |
| DH5833 | CTGU GILFORD CORS ARP | N411721.742 | W0724004.444 | 76005.6 |
| DI0876 | ACU5 ACUSHNET 5 CORS ARP | N414436.796 | W0705313.027 | 85116.8 |
| DI0966 | XMTS MTS FOX COOP CORS ARP | N420350.018 | W0711501.669 | 89879.3 |
| DI1874 | NYRH RIVERHEAD CORS ARP | N405524.088 | W0724250.560 | 92893.8 |
| DH5829 | CTEG EAST GRANBY CORS ARP | N415524.347 | W0724155.881 | 100480.2 |
| DJ5206 | MOR5 MORICHES 5 CORS ARP | N404722.259 | W0724446.639 | 103528.0 |

NEAREST NGS PUBLISHED CONTROL POINT

LW5273 WE 002 N412107.096 W0714550.063 0.0

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

CT02

FILE: log0120e.tps 000197881

NGS OPUS-RS SOLUTION REPORT

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USER: john.allen@sewall.com DATE: January 24, 2011
RINEX FILE: log0020r.11o TIME: 14:27:35 UTC

SOFTWARE: rsgps 1.35.1 RS29.prl 1.66 START: 2011/01/20 17:11:10
EPHEMERIS: igr16194.eph [rapid] STOP: 2011/01/20 17:36:10
NAV FILE: brdc0200.11n OBS USED: 2205 / 2250 : 98%
ANT NAME: TPSHIPER_GD QUALITY IND. 29.28/ 11.52
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.257

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2011.05404)

X: 1395963.071(m) 0.007(m) 1395962.301(m) 0.007(m)
Y: -4588704.353(m) 0.010(m) -4588702.917(m) 0.010(m)
Z: 4190125.656(m) 0.011(m) 4190125.577(m) 0.011(m)

LAT: 41 19 53.37838 0.006(m) 41 19 53.41067 0.006(m)
E LON: 286 55 14.39828 0.005(m) 286 55 14.38457 0.005(m)
W LON: 73 4 45.60172 0.005(m) 73 4 45.61543 0.005(m)
EL HGT: -18.134(m) 0.015(m) -19.387(m) 0.015(m)
ORTHO HGT: 11.364(m) 0.021(m) [NAVD88 (Computed using GEOID09)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 18) SPC (0600 CT)
Northing (Y) [meters] 4577336.531 207777.268
Easting (X) [meters] 660722.862 277231.699
Convergence [degrees] 1.26870684 -0.21836790
Point Scale 0.99991791 0.99998933
Combined Factor 0.99992076 0.9999218

US NATIONAL GRID DESIGNATOR: 18TXL6072277336(NAD 83)

BASE STATIONS USED

| PID | DESIGNATION | LATITUDE | LONGITUDE | DISTANCE(m) |
|--------|--------------------------------|-------------|--------------|-------------|
| DH5825 | CTBR BROOKFIELD CORS ARP | N412949.864 | W0732505.674 | 33786.1 |
| DH5827 | CTDA DARIEN CORS ARP | N410357.069 | W0733025.942 | 46459.2 |
| DI0470 | NYLC LAKE CARMEL CORS ARP | N412851.876 | W0733905.369 | 50645.1 |
| DI1874 | NYRH RIVERHEAD CORS ARP | N405524.088 | W0724250.560 | 54729.6 |
| DH5839 | CTWI WINCHESTER CORS ARP | N415351.907 | W0730410.968 | 62898.0 |
| DJ5206 | MOR5 MORICHES 5 CORS ARP | N404722.259 | W0724446.639 | 66380.7 |
| DH5829 | CTEG EAST GRANBY CORS ARP | N415524.347 | W0724155.881 | 72989.5 |
| AJ4872 | LAMT LAMONT EARTH OBS CORS ARP | N410016.233 | W0735432.057 | 78519.9 |
| DH5835 | CTMA MANSFIELD CORS ARP | N414352.917 | W0721238.877 | 85006.8 |

NEAREST NGS PUBLISHED CONTROL POINT

LX3650 ANSONIA S O AND C CO STACK N412011.984 W0730438.658 597.5

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

851 8091A

FILE: 0788log0120a.tps 000198052

NGS OPUS-RS SOLUTION REPORT
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USER: JOHN.ALLEN@SEWALL.COM DATE: January 24, 2011
RINEX FILE: 0788020m.11o TIME: 16:46:11 UTC

SOFTWARE: rsgps 1.35.1 RS10.prl 1.66 START: 2011/01/20 12:50:30
EPHEMERIS: igr16194.eph [rapid] STOP: 2011/01/20 13:07:05
NAV FILE: brdc0200.11n OBS USED: 1377 / 1881 : 73%
ANT NAME: TPSHIPER_GD QUALITY IND. 22.60/ 3.53
ARP HEIGHT: 1.5 NORMALIZED RMS: 0.315

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2011.05354)

X: 1355444.567(m) 0.007(m) 1355443.800(m) 0.007(m)
Y: -4628726.574(m) 0.016(m) -4628725.137(m) 0.016(m)
Z: 4159494.166(m) 0.015(m) 4159494.082(m) 0.015(m)

LAT: 40 57 54.87900 0.007(m) 40 57 54.91084 0.007(m)
E LON: 286 19 18.40777 0.008(m) 286 19 18.39356 0.008(m)
W LON: 73 40 41.59223 0.008(m) 73 40 41.60644 0.008(m)
EL HGT: -23.291(m) 0.021(m) -24.550(m) 0.021(m)
ORTHO HGT: 7.519(m) 0.023(m) [NAVD88 (Computed using GEOID09)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 18) SPC (3101 NY E)
Northing (Y) [meters] 4535740.017 237013.412
Easting (X) [meters] 611223.495 219170.334
Convergence [degrees] 0.86664905 0.53878114
Point Scale 0.99975226 0.99995887
Combined Factor 0.99975591 0.99996252

US NATIONAL GRID DESIGNATOR: 18TXL1122335740(NAD 83)

BASE STATIONS USED

| PID | DESIGNATION | LATITUDE | LONGITUDE | DISTANCE(m) |
|--------|------------------------------|-------------|--------------|-------------|
| DF9200 | RVDI RIVERSIDE COOP CORS ARP | N410231.146 | W0733452.378 | 11799.7 |
| DI0624 | NYVH VALHALLA CORS ARP | N410456.221 | W0734904.125 | 17515.4 |
| DI0616 | NYQN QUEENS CORS ARP | N404310.261 | W0734348.267 | 27636.3 |
| DM4134 | NYBP BATTERY PARK CORS ARP | N404203.817 | W0740051.549 | 40796.4 |
| DI0446 | NYCI CENTRAL ISLIP CORS ARP | N404538.237 | W0731151.787 | 46448.3 |
| DI0470 | NYLC LAKE CARMEL CORS ARP | N412851.876 | W0733905.369 | 57332.3 |
| DI0880 | SHK5 SANDY HOOK 5 CORS ARP | N402817.341 | W0740041.741 | 61642.6 |
| DK7181 | NYNB NEWBURGH CORS ARP | N412942.806 | W0740131.973 | 65668.1 |
| DH3768 | NJMT NJMT CORS ARP | N404747.350 | W0742859.340 | 70385.4 |

NEAREST NGS PUBLISHED CONTROL POINT

AB3868 851 8091 A TIDAL N405754.878 W0734041.592 0.0

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.