

Final Survey Report

Colville National Forest

15137



2223 Drake Ave SW
Suite 200
Huntsville, AL 35805
(256) 971-9991 – office
(256) 971-1154 – fax

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Section 1: Narrative

1.1 Introduction

A survey was performed to support the acquisition of Light Detection and Ranging (LiDAR) data for the Colville National Forest, Colville, WA area of interest.

1.2 Applicable Standards

This Geodetic Control GPS Survey was conducted to support LiDAR data in accordance with the current USGS guidelines.

Section 2: Ground Control Geodetic Network Survey

2.1 Ground Control Points

The purpose of this survey was to collect ground control points for use during the processing of the LiDAR data to ensure that the highest possible accuracy was achieved. GPS observations at all ground control points in the AOI were made between July 08th, 2015 and July 25th 2015.

A graphical representation of all the Ground Control Points is provided in Figure 1:

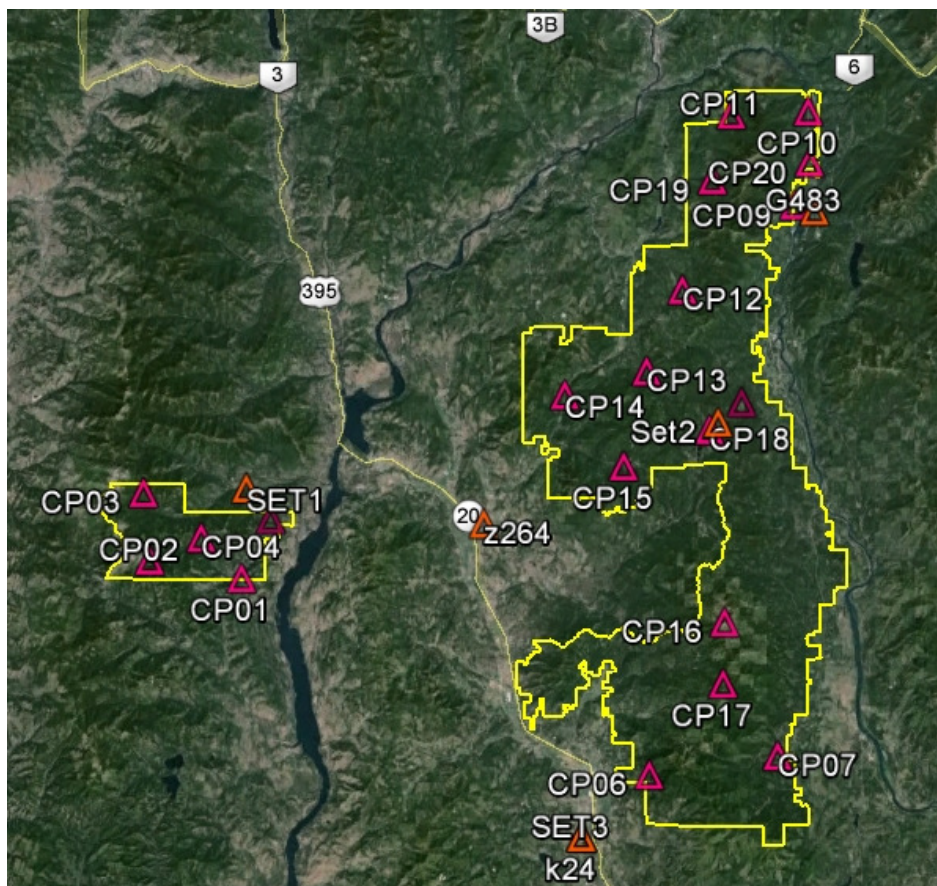


Figure 1: Ground Control Geodetic Network Points

2.2 Ground Control Point Collection

GPS observations were conducted on 26 ground control points using the Virtual Reference Station (VRS) and static methodology.

Virtual Reference Station (VRS) observations were made with a Topcon HiPER V with a Topcon TPSHIPERV antenna Topcon controlled by a Topcon Tesla Data Collector configured to log data at 1 Hz, and at 10 degrees mask.

Static observations were conducted with Leica System 500 dual-frequency GPS-receivers with a Leica AT502 antenna or a Topcon HiPER V with a Topcon TPSHIPERV antenna configured to log data at 1 Hz, and at a 10 degree mask, for a minimum duration of thirty (30) minutes.

2.3 Ground Control Data Processing and Analysis

Points observed with VRS were computed in “real-time” using GCS North American 1983, Geodetic Reference System 1980 (GRS 80) utilizing the Washington State Reference Network (WSRN)

Static data collected during each GPS session was processed using the National Geodetic Survey’s (NGS) On-Line Positioning User Service (OPUS) with their respective GPS antenna type, and antenna height reading. The resulting solution for each observation is referenced to NAD-83 (North American Datum). The RMS values for the latitude, longitude and ellipsoid heights for all results were reviewed to ensure that they are within acceptable limits. The geographic and ellipsoidal elevations supplied by NGS were transformed NAD 1983 USFS R6 Albers projection utilizing ArcMap and GeoCue software.

2.4 Network Survey Final Coordinates

After analyzing the projected values, a tabulated summary of the final coordinates was established for all ground control points. These summaries are listed below.

2.4.1 Ground Control Points

NAD 1983 USFS R6 Albers, NAVD88, Geoid12A, meters

Ground Control Points			
Point ID	Easting (m)	Northing (m)	Elevation (m)
CP01	727490.226	1603661.033	677.274
CP02	716730.343	1605496.203	1585.565
CP03	715763.609	1613430.392	1299.717
CP04	722654.452	1608319.785	1342.286
CP05	730787.282	1610747.763	898.281
CP06	776414.786	1581744.525	937.128
CP07	791566.549	1584336.168	891.456
CP08	786214.946	1625941.566	983.250
CP09	791905.459	1649448.354	751.598

Point ID	Easting (m)	Northing (m)	Elevation (m)
CP10	793243.046	1660532.541	761.038
CP11	784123.055	1659860.010	1201.918
CP12	778856.021	1639030.223	947.759
CP13	774867.731	1629326.022	846.422
CP14	765261.348	1626281.560	809.163
CP15	772446.447	1618059.246	914.201
CP16	784796.365	1600007.010	2081.371
CP17	784829.517	1592776.093	1497.268
CP18	782483.562	1622588.214	981.922
CP19	782067.600	1652068.848	956.407
CP20	793579.863	1654561.685	869.228
G 483	755254.621	214032.193	2518.520
Z 264	717461.886	175551.920	1866.614
K 24	730461.835	138913.618	1661.430
SET1	689266.551	178658.551	2311.096
SET2	744718.268	188519.490	3224.268
SET3	730470.061	138920.872	1661.125

Section 3: Ground Cover Classification Survey

3.1 Ground Cover Classification Check Point Collection

GPS observations were conducted on 116 ground check points using the Virtual Reference Station (VRS) and static methodology.

Virtual Reference Station (VRS) observations were made with a Topcon HiPER V with a Topcon TPSHIPERV antenna Topcon controlled by a Topcon Tesla Data Collector configured to log data at 1 Hz, and at 10 degrees mask.

Static observations were conducted with Leica System 500 dual-frequency GPS-receivers with a Leica AT502 antenna or a Topcon HiPER V with a Topcon TPSHIPERV antenna configured to log data at 1 Hz, and at a 10 degree mask, for a minimum duration of thirty (30) minutes.

All check points collected represent differing types of ground cover observed during the course of survey and were conducted between July 08th, 2015 and July 25th 2015.

The purpose of this survey was to collect ground check points for use during the processing data for LiDAR Vertical Accuracy Assessment.

A graphical representation of all the Ground Cover Classification Check Points is provided in Figure 2:

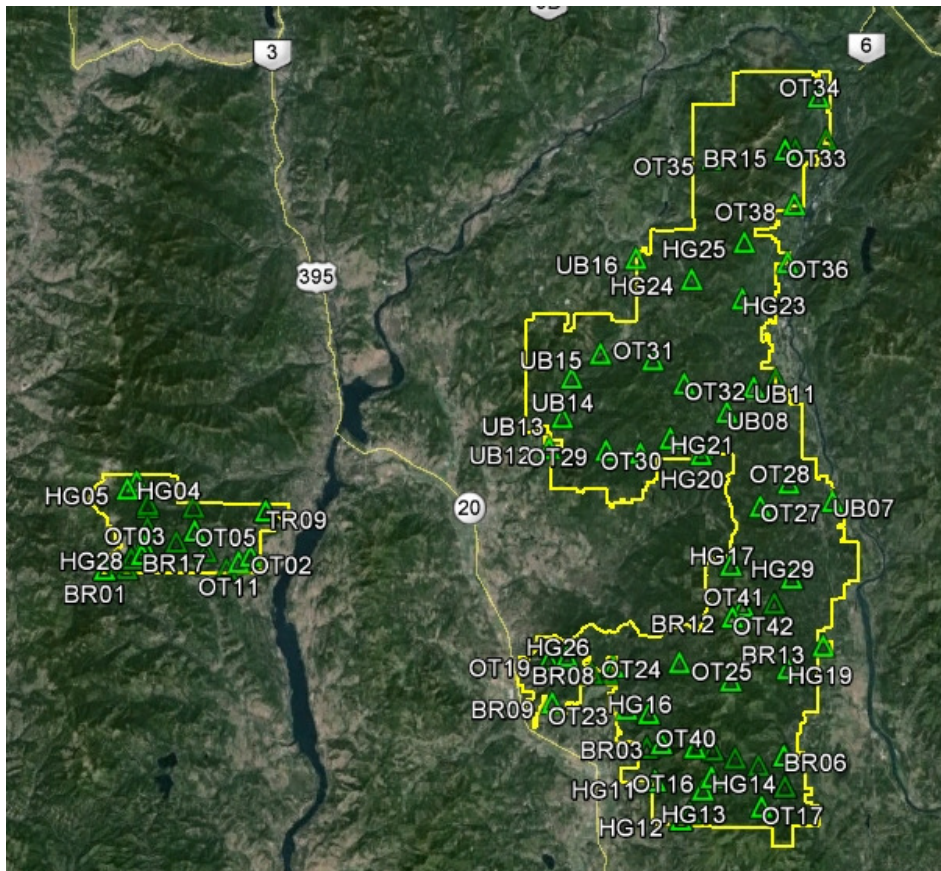


Figure 2: Ground Cover Classification Check Points

3.2 Check Point Data Processing and Analysis

Points observed with VRS were computed in “real-time” using GCS North American 1983, Geodetic Reference System 1980 (GRS 80) utilizing the Washington State Reference Network (WSRN)

Static data collected during each GPS session was processed using the National Geodetic Survey’s (NGS) On-Line Positioning User Service (OPUS) with their respective GPS antenna type, and antenna height reading. The resulting solution for each observation is referenced to NAD-83 (North American Datum). The RMS values for the latitude, longitude and ellipsoid heights for all results were reviewed to ensure that they are within acceptable limits. The geographic and ellipsoidal elevations supplied by NGS were transformed NAD 1983 USFS R6 Albers projection utilizing ArcMap and GeoCue software.

A tabulated summary of the final coordinates resulting from the Ground Cover Classification Survey is listed in sections 3.2.1

3.3 Network Survey Final Coordinates

After analyzing the projected values, a tabulated summary of the final coordinates was established for all ground cover classification check points. These summaries are listed below.

3.3.1 Ground Cover Classification Check Points

NAD 1983 USFS R6 Albers, NAVD88, Geoid12A, meters

LiDAR Check Points				
Point ID	Easting (m)	Northing (m)	Elevation (m)	Description
BR01	712459.247	1603645.355	1415.574	Brush
BR02	717237.584	1610839.141	1122.894	Brush
BR03	777030.953	1585313.676	1096.505	Brush
BR04	781286.886	1585198.539	1160.192	Brush
BR05	782972.606	1584704.474	1054.521	Brush
BR06	791167.125	1584258.893	910.830	Brush
BR07	780472.019	1577471.008	879.796	Brush
BR08	771222.585	1593957.918	671.854	Brush
BR09	764321.426	1589619.260	851.707	Brush
BR10	789619.769	1601734.144	1103.882	Brush
BR11	785997.525	1601327.451	1590.481	Brush
BR12	784794.655	1600020.691	2082.787	Brush
BR13	795385.554	1596992.491	735.919	Brush

Point ID	Easting (m)	Northing (m)	Elevation (m)	Description
BR14	790694.013	1653845.660	1180.857	Brush
BR15	789511.407	1653782.856	1563.440	Brush
BR16	722674.914	1608340.690	1343.842	Brush
BR17	716739.371	1605465.387	1586.727	Brush
BR18	730744.600	1610781.069	903.091	Brush
HG01	714981.701	1603788.154	1512.653	High Grass
HG02	712483.826	1603646.239	1416.544	High Grass
HG03	722464.421	1611052.788	850.111	High Grass
HG04	715903.115	1613765.844	1327.112	High Grass
HG05	714853.828	1612878.581	1306.648	High Grass
HG06	722668.497	1608330.368	1343.607	High Grass
HG07	730783.252	1610774.032	899.022	High Grass
HG08	775341.566	1584739.885	889.780	High Grass
HG09	781177.915	1585107.921	1172.327	High Grass
HG10	791382.789	1584239.988	899.608	High Grass
HG11	776416.573	1580980.427	944.693	High Grass
HG12	779502.369	1576592.837	852.136	High Grass
HG13	781933.083	1580113.977	1411.033	High Grass
HG14	782900.725	1581574.095	1146.082	High Grass
HG15	763788.192	1594549.350	1190.621	High Grass
HG16	775476.644	1588737.780	817.971	High Grass
HG17	784477.239	1606011.661	1274.868	High Grass
HG18	789588.693	1601740.040	1105.347	High Grass
HG19	791328.831	1594269.549	1070.918	High Grass
HG20	780744.685	1618582.070	963.311	High Grass
HG21	777110.693	1620340.233	1177.611	High Grass
HG22	789553.744	1653795.239	1563.980	High Grass
HG23	785034.283	1636568.326	964.972	High Grass
HG24	779130.159	1638683.086	967.807	High Grass
HG25	785072.539	1643024.824	1276.134	High Grass
HG26	765878.555	1595013.434	1281.855	High Grass
HG27	713992.176	1604570.766	1363.422	High Grass
HG28	716674.169	1605476.350	1584.703	High Grass
HG29	791527.234	1604676.189	853.718	High Grass

Point ID	Easting (m)	Northing (m)	Elevation (m)	Description
OT01	712493.386	1603649.924	1417.717	Open Terrain/Bare Earth
OT02	729131.124	1605569.907	704.701	Open Terrain/Bare Earth
OT03	716884.102	1606506.796	1504.753	Open Terrain/Bare Earth
OT04	724037.025	1605951.515	949.401	Open Terrain/Bare Earth
OT05	722662.608	1608323.814	1343.097	Open Terrain/Bare Earth
OT06	730749.314	1610788.092	903.734	Open Terrain/Bare Earth
OT07	726404.169	1604023.646	685.982	Open Terrain/Bare Earth
OT08	720608.354	1606988.858	1066.606	Open Terrain/Bare Earth
OT09	717264.390	1608502.125	1326.143	Open Terrain/Bare Earth
OT10	717239.892	1611234.389	1082.704	Open Terrain/Bare Earth
OT11	727765.344	1604852.777	668.366	Open Terrain/Bare Earth
OT12	776974.420	1585286.816	1097.952	Open Terrain/Bare Earth
OT13	791189.738	1584269.908	910.319	Open Terrain/Bare Earth
OT14	779492.979	1576577.071	852.296	Open Terrain/Bare Earth
OT15	780507.753	1577440.971	875.303	Open Terrain/Bare Earth
OT16	782920.402	1581591.229	1143.846	Open Terrain/Bare Earth
OT17	788752.488	1578333.945	911.129	Open Terrain/Bare Earth
OT18	791371.363	1580732.109	794.593	Open Terrain/Bare Earth
OT19	763792.839	1594530.720	1191.858	Open Terrain/Bare Earth
OT20	770585.288	1593187.959	668.417	Open Terrain/Bare Earth
OT21	768796.095	1593116.886	745.119	Open Terrain/Bare Earth
OT22	775470.338	1588714.357	818.562	Open Terrain/Bare Earth
OT23	772941.773	1589120.709	747.362	Open Terrain/Bare Earth
OT24	778841.655	1594653.759	951.385	Open Terrain/Bare Earth
OT25	784821.501	1592746.244	1497.692	Open Terrain/Bare Earth
OT26	784496.544	1606010.595	1273.037	Open Terrain/Bare Earth
OT27	787691.439	1612815.531	1114.163	Open Terrain/Bare Earth
OT28	790933.495	1615566.526	870.168	Open Terrain/Bare Earth
OT29	769761.800	1618779.574	897.850	Open Terrain/Bare Earth
OT30	773714.684	1618551.638	947.237	Open Terrain/Bare Earth
OT31	774883.529	1629301.217	847.630	Open Terrain/Bare Earth
OT32	778561.137	1626655.011	1158.943	Open Terrain/Bare Earth
OT33	789517.354	1653799.066	1564.949	Open Terrain/Bare Earth
OT34	793228.147	1660026.689	749.746	Open Terrain/Bare Earth

Point ID	Easting (m)	Northing (m)	Elevation (m)	Description
OT35	781204.578	1652580.549	919.034	Open Terrain/Bare Earth
OT36	790108.334	1640824.750	629.733	Open Terrain/Bare Earth
OT37	794180.030	1655059.647	808.056	Open Terrain/Bare Earth
OT38	790673.708	1647498.189	763.142	Open Terrain/Bare Earth
OT39	715461.306	1604943.688	1491.683	Open Terrain/Bare Earth
OT40	780890.116	1584953.180	1186.435	Open Terrain/Bare Earth
OT41	786002.288	1601310.901	1592.203	Open Terrain/Bare Earth
OT42	784815.370	1600028.186	2084.926	Open Terrain/Bare Earth
OT43	715477.471	1604949.329	1492.514	Open Terrain/Bare Earth
OT44	715485.556	1604950.841	1492.858	Open Terrain/Bare Earth
TR01	714981.611	1603779.429	1512.170	Trees
TR02	781201.360	1585145.250	1168.084	Trees
TR03	776387.007	1581033.202	949.546	Trees
TR04	779519.347	1576568.283	852.075	Trees
TR05	788751.082	1578359.273	912.179	Trees
TR06	791552.352	1604683.879	853.424	Trees
TR07	789551.651	1653789.382	1564.406	Trees
TR08	722657.416	1608338.654	1342.957	Trees
TR09	730733.079	1610791.387	904.750	Trees
UB01	775352.670	1584768.828	892.823	Urban Terrain
UB02	777013.843	1585311.337	1095.067	Urban Terrain
UB03	782936.908	1584718.241	1050.721	Urban Terrain
UB04	785557.796	1583842.546	961.810	Urban Terrain
UB05	788272.845	1583063.981	904.157	Urban Terrain
UB06	791372.150	1580731.176	794.502	Urban Terrain
UB07	796014.842	1613588.930	629.250	Urban Terrain
UB08	783575.676	1623528.805	984.020	Urban Terrain
UB09	780908.484	1619313.097	968.313	Urban Terrain
UB10	789153.056	1627466.437	787.184	Urban Terrain
UB11	786621.181	1626473.854	986.771	Urban Terrain
UB12	763210.438	1618808.836	671.742	Urban Terrain
UB13	764635.785	1622409.019	729.879	Urban Terrain
UB14	765585.488	1626969.220	807.904	Urban Terrain
UB15	768823.824	1629837.085	805.427	Urban Terrain



Appendix A: National Geodetic Survey STATIC / RAPID STATIC Solutions



FILE: CNTR01.O00 OP1437417922868

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com DATE: July 20, 2015
RINEX FILE: 0000194t.15o TIME: 18:48:34 UTC

SOFTWARE: rsgps 1.37 RS94.prl 1.99.2 START: 2015/07/13 19:40:17
EPHEMERIS: igr18531.eph [rapid] STOP: 2015/07/13 20:10:59
NAV FILE: brdc1940.15n OBS USED: 840 / 925 : 91%
ANT NAME: LEIAT502 NONE QUALITY IND. 4.93/ 12.42
ARP HEIGHT: 1.549 NORMALIZED RMS: 0.320

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53104)

X: -2006724.497(m) 0.009(m) -2006725.396(m) 0.009(m)
Y: -3730628.298(m) 0.026(m) -3730627.110(m) 0.026(m)
Z: 4753133.052(m) 0.046(m) 4753133.070(m) 0.046(m)

LAT: 48 28 58.51595 0.014(m) 48 28 58.53137 0.014(m)
E LON: 241 43 26.25399 0.007(m) 241 43 26.18803 0.007(m)
W LON: 118 16 33.74601 0.007(m) 118 16 33.81197 0.007(m)
EL HGT: 659.848(m) 0.051(m) 659.450(m) 0.051(m)
ORTHO HGT: 677.275(m) 0.054(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5370763.436 168018.284
Easting (X) [meters] 405705.797 689009.148
Convergence [degrees] -0.95551582 1.90395645
Point Scale 0.99970924 0.99996253
Combined Factor 0.99960587 0.99985913

US NATIONAL GRID DESIGNATOR: 11UMP0570570763(NAD 83)



FILE: CNTR03.O00 OP1438069348944

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: cntr205c.15o

DATE: July 28, 2015
TIME: 07:45:53 UTC

SOFTWARE: rsgps 1.37 RS94.prl 1.99.2 START: 2015/07/24 02:49:16
EPHEMERIS: igr18545.eph [rapid] STOP: 2015/07/24 03:19:28
NAV FILE: brdc2050.15n OBS USED: 2079 / 2548 : 82%
ANT NAME: LEIAT502 NONE QUALITY IND. 26.78/ 23.07
ARP HEIGHT: 1.623 NORMALIZED RMS: 0.287

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.55925)

X: -2013495.571(m) 0.017(m) -2013496.471(m) 0.017(m)
Y: -3718917.261(m) 0.034(m) -3718916.074(m) 0.034(m)
Z: 4760231.397(m) 0.035(m) 4760231.416(m) 0.035(m)

LAT: 48 34 22.64527 0.007(m) 48 34 22.66061 0.007(m)
E LON: 241 34 4.82434 0.005(m) 241 34 4.75817 0.005(m)
W LON: 118 25 55.17566 0.005(m) 118 25 55.24183 0.005(m)
EL HGT: 1282.859(m) 0.051(m) 1282.467(m) 0.051(m)
ORTHO HGT: 1299.717(m) 0.053(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5380975.049 177653.784
Easting (X) [meters] 394369.251 677174.217
Convergence [degrees] -1.07380564 1.78784651
Point Scale 0.99973708 0.99997379
Combined Factor 0.99953612 0.99977278

US NATIONAL GRID DESIGNATOR: 11ULP9436980975(NAD 83)



FILE: CNTR10.O00 OP1436809658282

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 13, 2015
RINEX FILE: cntr192u.15o TIME: 18:45:40 UTC

SOFTWARE: rsgps 1.37 RS93.prl 1.99.2 START: 2015/07/11 20:54:59
EPHEMERIS: igr18526.eph [rapid] STOP: 2015/07/11 21:25:03
NAV FILE: brdc1920.15n OBS USED: 1680 / 1680 : 100%
ANT NAME: LEIAT502 NONE QUALITY IND. 12.74/ 25.14
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.267

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52570)

X: -1947157.724(m) 0.009(m) -1947158.623(m) 0.009(m)
Y: -3744775.303(m) 0.015(m) -3744774.113(m) 0.015(m)
Z: 4767081.125(m) 0.017(m) 4767081.142(m) 0.017(m)

LAT: 48 40 9.67151 0.005(m) 48 40 9.68745 0.005(m)
E LON: 242 31 37.48464 0.004(m) 242 31 37.41883 0.004(m)
W LON: 117 28 22.51536 0.004(m) 117 28 22.58117 0.004(m)
EL HGT: 966.375(m) 0.023(m) 965.965(m) 0.023(m)
ORTHO HGT: 983.252(m) 0.029(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5390808.310 191011.610
Easting (X) [meters] 465181.031 747429.427
Convergence [degrees] -0.35512508 2.50189534
Point Scale 0.99961489 0.99998860
Combined Factor 0.99946352 0.99983717

US NATIONAL GRID DESIGNATOR: 11UMP6518190808(NAD 83)



FILE: CNTR11.O00 OP1436824348325

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 13, 2015
RINEX FILE: 0000192v.15o TIME: 22:30:55 UTC

SOFTWARE: rsgps 1.37 RS90.prl 1.99.2 START: 2015/07/11 21:49:20
EPHEMERIS: igr18526.eph [rapid] STOP: 2015/07/11 22:19:41
NAV FILE: brdc1920.15n OBS USED: 1458 / 1458 : 100%
ANT NAME: LEIAT502 NONE QUALITY IND. 32.18/ 30.66
ARP HEIGHT: 1.444 NORMALIZED RMS: 0.230

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52581)

X: -1933291.721(m) 0.007(m) -1933292.621(m) 0.007(m)
Y: -3732028.272(m) 0.012(m) -3732027.083(m) 0.012(m)
Z: 4782284.188(m) 0.016(m) 4782284.207(m) 0.016(m)

LAT: 48 52 44.91343 0.003(m) 48 52 44.92948 0.003(m)
E LON: 242 36 52.63165 0.002(m) 242 36 52.56559 0.002(m)
W LON: 117 23 7.36835 0.002(m) 117 23 7.43441 0.002(m)
EL HGT: 735.158(m) 0.021(m) 734.751(m) 0.021(m)
ORTHO HGT: 751.597(m) 0.027(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5414092.367 214603.228
Easting (X) [meters] 471744.218 752825.939
Convergence [degrees] -0.29031800 2.56707127
Point Scale 0.99960981 1.00003069
Combined Factor 0.99949466 0.99991549

US NATIONAL GRID DESIGNATOR: 11UMQ7174414092(NAD 83)



FILE: CNTR12.O00 OP1437418331725

6011 Warning - OPUS-RS was able to find a set of reference stations
6011 with data suitable for use with your dataset. However, your
6011 position does not fall within the polygon enclosing these reference
6011 stations. This means that the geographic interpolation algorithms
6011 performed within OPUS-RS must instead perform extrapolation.
6011 Extrapolation, especially if your position is far from the
6011 reference stations, is prone to error. Use this solution with
6011 caution.

p025
rkd1
drao
brew
mtfv

Your station is 6.2 KM outside the polygon enclosing the reference stations

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: 0000193s.15o

DATE: July 20, 2015
TIME: 18:55:58 UTC

SOFTWARE: rsgps 1.37 RS52.prl 1.99.2 START: 2015/07/12 18:27:15
EPHEMERIS: igr18530.eph [rapid] STOP: 2015/07/12 19:56:10
NAV FILE: brdc1930.15n OBS USED: 4265 / 4930 : 87%
ANT NAME: LEIAT502 NONE QUALITY IND. 18.43/ 49.63
ARP HEIGHT: 1.325 NORMALIZED RMS: 0.330

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52822)

X: -1927958.318(m) 0.007(m) -1927959.218(m) 0.007(m)
Y: -3725419.481(m) 0.014(m) -3725418.293(m) 0.014(m)
Z: 4789548.367(m) 0.015(m) 4789548.387(m) 0.015(m)

LAT: 48 58 42.44035 0.003(m) 48 58 42.45644 0.003(m)
E LON: 242 38 16.01991 0.002(m) 242 38 15.95376 0.002(m)
W LON: 117 21 43.98009 0.002(m) 117 21 44.04624 0.002(m)
EL HGT: 744.683(m) 0.021(m) 744.277(m) 0.021(m)



ORTHO HGT: 761.042(m) 0.027(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 11)	SPC (4601 WA N)	
Northing (Y) [meters]	5425124.012	225713.261
Easting (X) [meters]	473495.156	754025.270
Convergence [degrees]	-0.27328061	2.58431690
Point Scale	0.99960863	1.00005535
Combined Factor	0.99949199	0.99993866

US NATIONAL GRID DESIGNATOR: 11UMQ7349525124(NAD 83)



FILE: CNTR13.O00 OP1437418640098

6011 Warning - OPUS-RS was able to find a set of reference stations
6011 with data suitable for use with your dataset. However, your
6011 position does not fall within the polygon enclosing these reference
6011 stations. This means that the geographic interpolation algorithms
6011 performed within OPUS-RS must instead perform extrapolation.
6011 Extrapolation, especially if your position is far from the
6011 reference stations, is prone to error. Use this solution with
6011 caution.

p025
rkd1
drao
spn6
brew
p422

Your station is 3.4 KM outside the polygon enclosing the reference stations

NGS OPUS-RS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: cntr195w.15o

DATE: July 20, 2015
TIME: 19:00:35 UTC

SOFTWARE: rsgps 1.37 RS52.prl 1.99.2 START: 2015/07/14 22:02:11
EPHEMERIS: igr18532.eph [rapid] STOP: 2015/07/14 22:36:03
NAV FILE: brdc1950.15n OBS USED: 1565 / 1885 : 83%
ANT NAME: LEIAT502 NONE QUALITY IND. 13.39/ 12.58
ARP HEIGHT: 1.619 NORMALIZED RMS: 0.423

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53405)

X: -1936327.403(m) 0.021(m) -1936328.304(m) 0.021(m)
Y: -3721726.232(m) 0.025(m) -3721725.045(m) 0.025(m)
Z: 4789631.179(m) 0.030(m) 4789631.199(m) 0.030(m)

LAT: 48 58 30.12367 0.006(m) 48 58 30.13966 0.006(m)
E LON: 242 30 47.12736 0.010(m) 242 30 47.06112 0.010(m)
W LON: 117 29 12.87264 0.010(m) 117 29 12.93888 0.010(m)



EL HGT: 1185.516(m) 0.042(m) 1185.113(m) 0.042(m)
ORTHO HGT: 1201.919(m) 0.046(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 11)	SPC (4601 WA N)	
Northing (Y) [meters]	5424794.697	224928.912
Easting (X) [meters]	464368.504	744922.361
Convergence [degrees]	-0.36733956	2.49148089
Point Scale	0.99961560	1.00005445
Combined Factor	0.99942992	0.99986869

US NATIONAL GRID DESIGNATOR: 11UMQ6436824794(NAD 83)



FILE: CNTR14.O00 OP1437417605014

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: cntr194x.15o

DATE: July 20, 2015
TIME: 18:46:35 UTC

SOFTWARE: rsgps 1.37 RS93.prl 1.99.2 START: 2015/07/13 23:36:50
EPHEMERIS: igr18531.eph [rapid] STOP: 2015/07/14 00:10:16
NAV FILE: brdc1940.15n OBS USED: 1974 / 2611 : 76%
ANT NAME: LEIAT502 NONE QUALITY IND. 40.86/ 45.39
ARP HEIGHT: 1.466 NORMALIZED RMS: 0.293

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53149)

X: -1948682.968(m) 0.013(m) -1948683.868(m) 0.013(m)
Y: -3732665.416(m) 0.025(m) -3732664.227(m) 0.025(m)
Z: 4775840.870(m) 0.032(m) 4775840.889(m) 0.032(m)

LAT: 48 47 20.82318 0.005(m) 48 47 20.83911 0.005(m)
E LON: 242 25 57.52963 0.007(m) 242 25 57.46360 0.007(m)
W LON: 117 34 2.47037 0.007(m) 117 34 2.53640 0.007(m)
EL HGT: 931.014(m) 0.041(m) 930.609(m) 0.041(m)
ORTHO HGT: 947.763(m) 0.045(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5404168.628 204018.592
Easting (X) [meters] 458327.557 739915.525
Convergence [degrees] -0.42681989 2.43158883
Point Scale 0.99962133 1.00001097
Combined Factor 0.99947550 0.99986508

US NATIONAL GRID DESIGNATOR: 11UMQ5832704168(NAD 83)



FILE: CNTR15.O00 OP1436891520303

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 14, 2015
RINEX FILE: cntr194t.15o TIME: 18:02:14 UTC

SOFTWARE: rsgps 1.37 RS94.prl 1.99.2 START: 2015/07/13 19:55:57
EPHEMERIS: igr18531.eph [rapid] STOP: 2015/07/13 20:58:20
NAV FILE: brdc1940.15n OBS USED: 858 / 1962 : 44%
ANT NAME: LEIAT502 NONE QUALITY IND. 24.89/ 7.37
ARP HEIGHT: 1.573 NORMALIZED RMS: 0.359

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53110)

X: -1955779.256(m) 0.011(m) -1955780.155(m) 0.011(m)
Y: -3737014.730(m) 0.016(m) -3737013.541(m) 0.016(m)
Z: 4769441.919(m) 0.021(m) 4769441.937(m) 0.021(m)

LAT: 48 42 10.45676 0.003(m) 48 42 10.47262 0.003(m)
E LON: 242 22 28.33338 0.004(m) 242 22 28.26747 0.004(m)
W LON: 117 37 31.66662 0.004(m) 117 37 31.73253 0.004(m)
EL HGT: 829.607(m) 0.028(m) 829.200(m) 0.028(m)
ORTHO HGT: 846.427(m) 0.033(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5394618.673 194260.057
Easting (X) [meters] 453980.702 736048.838
Convergence [degrees] -0.46991701 2.38832471
Point Scale 0.99962602 0.99999442
Combined Factor 0.99949607 0.99986442

US NATIONAL GRID DESIGNATOR: 11UMP5398094618(NAD 83)



FILE: CNTR16.O00 OP1436809843216

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 13, 2015
RINEX FILE: cntr193s.15o TIME: 18:55:27 UTC

SOFTWARE: rsgps 1.37 RS94.prl 1.99.2 START: 2015/07/12 18:09:57
EPHEMERIS: igr18530.eph [rapid] STOP: 2015/07/12 18:41:07
NAV FILE: brdc1930.15n OBS USED: 1764 / 2454 : 72%
ANT NAME: LEIAT502 NONE QUALITY IND. 27.25/ 26.87
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.314

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52813)

X: -1965310.188(m) 0.023(m) -1965311.087(m) 0.023(m)
Y: -3734334.286(m) 0.042(m) -3734333.097(m) 0.042(m)
Z: 4767585.597(m) 0.040(m) 4767585.615(m) 0.040(m)

LAT: 48 40 40.81056 0.010(m) 48 40 40.82635 0.010(m)
E LON: 242 14 34.82968 0.002(m) 242 14 34.76373 0.002(m)
W LON: 117 45 25.17032 0.002(m) 117 45 25.23627 0.002(m)
EL HGT: 792.212(m) 0.061(m) 791.807(m) 0.061(m)
ORTHO HGT: 809.167(m) 0.064(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5391938.365 191097.955
Easting (X) [meters] 444275.882 726486.319
Convergence [degrees] -0.56852345 2.29039884
Point Scale 0.99963815 0.99999007
Combined Factor 0.99951406 0.99986593

US NATIONAL GRID DESIGNATOR: 11UMP4427591938(NAD 83)



FILE: CNTR17.O00 OP1438567465975

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com DATE: August 03, 2015
RINEX FILE: cntr192v.15o TIME: 02:07:38 UTC

SOFTWARE: rsgps 1.37 RS52.prl 1.99.2 START: 2015/07/11 21:04:05
EPHEMERIS: igs18526.eph [precise] STOP: 2015/07/11 21:39:29
NAV FILE: brdc1920.15n OBS USED: 1050 / 1235 : 85%
ANT NAME: LEIAT502 NONE QUALITY IND. 14.33/ 28.97
ARP HEIGHT: 1.601 NORMALIZED RMS: 0.280

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52573)

X: -1962136.073(m) 0.007(m) -1962136.972(m) 0.007(m)
Y: -3743226.478(m) 0.017(m) -3743225.288(m) 0.017(m)
Z: 4762094.237(m) 0.023(m) 4762094.254(m) 0.023(m)

LAT: 48 36 7.95238 0.004(m) 48 36 7.96820 0.004(m)
E LON: 242 20 14.03203 0.003(m) 242 20 13.96620 0.003(m)
W LON: 117 39 45.96797 0.003(m) 117 39 46.03380 0.003(m)
EL HGT: 897.218(m) 0.029(m) 896.810(m) 0.029(m)
ORTHO HGT: 914.204(m) 0.034(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5383448.770 182958.293
Easting (X) [meters] 451138.678 733766.470
Convergence [degrees] -0.49717696 2.36054968
Point Scale 0.99962933 0.99997798
Combined Factor 0.99948879 0.99983739

US NATIONAL GRID DESIGNATOR: 11UMP5113883448(NAD 83)



FILE: CNTR18.O00 OP1438567399753

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com DATE: August 03, 2015
RINEX FILE: cntr193s.15o TIME: 02:08:22 UTC

SOFTWARE: rsgps 1.37 RS94.prl 1.99.2 START: 2015/07/12 18:34:27
EPHEMERIS: igs18530.eph [precise] STOP: 2015/07/12 19:09:18
NAV FILE: brdc1930.15n OBS USED: 520 / 1900 : 27%
ANT NAME: LEIAT502 NONE QUALITY IND. 19.86/ 11.02
ARP HEIGHT: 1.408 NORMALIZED RMS: 0.389

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52818)

X: -1951098.066(m) 0.019(m) -1951098.964(m) 0.019(m)
Y: -3754174.057(m) 0.057(m) -3754172.866(m) 0.057(m)
Z: 4758316.122(m) 0.051(m) 4758316.138(m) 0.051(m)

LAT: 48 32 55.44884 0.012(m) 48 32 55.46478 0.012(m)
E LON: 242 32 18.43306 0.015(m) 242 32 18.36744 0.015(m)
W LON: 117 27 41.56694 0.015(m) 117 27 41.63256 0.015(m)
EL HGT: 1106.295(m) 0.076(m) 1105.882(m) 0.076(m)
ORTHO HGT: 1123.072(m) 0.078(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5377395.685 177648.478
Easting (X) [meters] 465937.456 748853.884
Convergence [degrees] -0.34594112 2.51036393
Point Scale 0.99961425 0.99997052
Combined Factor 0.99944097 0.99979717

US NATIONAL GRID DESIGNATOR: 11UMP6593777395(NAD 83)



FILE: CNTR20.tps OP1436894183530

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 14, 2015
RINEX FILE: cntr194u.15o TIME: 18:54:51 UTC

SOFTWARE: rsgps 1.37 RS93.prl 1.99.2 START: 2015/07/13 20:18:54
EPHEMERIS: igr18531.eph [rapid] STOP: 2015/07/13 20:49:10
NAV FILE: brdc1940.15n OBS USED: 1640 / 1904 : 86%
ANT NAME: TPSHIPER_V NONE QUALITY IND. 9.85/ 17.66
ARP HEIGHT: 1.943 NORMALIZED RMS: 0.311

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53111)

X: -1960917.254(m) 0.020(m) -1960918.151(m) 0.020(m)
Y: -3765977.384(m) 0.029(m) -3765976.192(m) 0.029(m)
Z: 4745523.997(m) 0.036(m) 4745524.011(m) 0.036(m)

LAT: 48 22 17.40095 0.004(m) 48 22 17.41680 0.004(m)
E LON: 242 29 39.59595 0.006(m) 242 29 39.53055 0.006(m)
W LON: 117 30 20.40405 0.006(m) 117 30 20.46945 0.006(m)
EL HGT: 1480.400(m) 0.050(m) 1479.983(m) 0.050(m)
ORTHO HGT: 1497.265(m) 0.053(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5357715.800 157817.476
Easting (X) [meters] 462551.123 746451.467
Convergence [degrees] -0.37797474 2.47751463
Point Scale 0.99961723 0.99995203
Combined Factor 0.99938536 0.99972008

US NATIONAL GRID DESIGNATOR: 11UMP6255157715(NAD 83)



FILE: CNTR21.O00 OP1436809708559

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 13, 2015
RINEX FILE: cntr192w.15o TIME: 18:48:43 UTC

SOFTWARE: rsgps 1.37 RS93.prl 1.99.2 START: 2015/07/11 22:22:29
EPHEMERIS: igr18526.eph [rapid] STOP: 2015/07/11 22:53:25
NAV FILE: brdc1920.15n OBS USED: 1932 / 2191 : 88%
ANT NAME: LEIAT502 NONE QUALITY IND. 30.29/ 27.42
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.278

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52587)

X: -1951678.995(m) 0.009(m) -1951679.894(m) 0.009(m)
Y: -3745161.441(m) 0.018(m) -3745160.251(m) 0.018(m)
Z: 4764941.081(m) 0.019(m) 4764941.098(m) 0.019(m)

LAT: 48 38 24.85961 0.007(m) 48 38 24.87552 0.007(m)
E LON: 242 28 30.26384 0.002(m) 242 28 30.19804 0.002(m)
W LON: 117 31 29.73616 0.002(m) 117 31 29.80196 0.002(m)
EL HGT: 965.080(m) 0.027(m) 964.670(m) 0.027(m)
ORTHO HGT: 981.925(m) 0.032(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5387597.048 187611.120
Easting (X) [meters] 461329.840 743741.727
Convergence [degrees] -0.39400189 2.46317598
Point Scale 0.99961837 0.99998382
Combined Factor 0.99946720 0.99983260

US NATIONAL GRID DESIGNATOR: 11UMP6132987597(NAD 83)



FILE: CNTR22.O00 OP1438567518664

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com DATE: August 03, 2015
RINEX FILE: cntr193b.15o TIME: 02:08:37 UTC

SOFTWARE: rsgps 1.37 RS93.prl 1.99.2 START: 2015/07/12 01:35:33
EPHEMERIS: igs18530.eph [precise] STOP: 2015/07/12 02:06:37
NAV FILE: brdc1930.15n OBS USED: 1035 / 1180 : 88%
ANT NAME: LEIAT502 NONE QUALITY IND. 22.55/ 19.19
ARP HEIGHT: 1.576 NORMALIZED RMS: 0.331

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52624)

X: -1943843.609(m) 0.012(m) -1943844.508(m) 0.012(m)
Y: -3738888.581(m) 0.016(m) -3738887.392(m) 0.016(m)
Z: 4772798.218(m) 0.017(m) 4772798.236(m) 0.017(m)

LAT: 48 44 55.99187 0.004(m) 48 44 56.00783 0.004(m)
E LON: 242 31 48.48124 0.004(m) 242 31 48.41535 0.004(m)
W LON: 117 28 11.51876 0.004(m) 117 28 11.58465 0.004(m)
EL HGT: 806.656(m) 0.026(m) 806.247(m) 0.026(m)
ORTHO HGT: 823.455(m) 0.031(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5399647.789 199857.395
Easting (X) [meters] 465460.404 747267.767
Convergence [degrees] -0.35326166 2.50416956
Point Scale 0.99961466 1.00000296
Combined Factor 0.99948831 0.99987656

US NATIONAL GRID DESIGNATOR: 11UMP6546099647(NAD 83)



FILE: CNTR23.O00 OP1437028750664

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: cntr195u.15o

DATE: July 16, 2015
TIME: 06:42:22 UTC

SOFTWARE: rsgps 1.37 RS54.prl 1.99.2 START: 2015/07/14 20:05:38
EPHEMERIS: igr18532.eph [rapid] STOP: 2015/07/14 20:50:34
NAV FILE: brdc1950.15n OBS USED: 355 / 1015 : 35%
ANT NAME: LEIAT502 NONE QUALITY IND. 8.04/ 2.75
ARP HEIGHT: 1.481 NORMALIZED RMS: 0.381

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53384)

X: -1940980.556(m) 0.021(m) -1940981.456(m) 0.021(m)
Y: -3725694.665(m) 0.027(m) -3725693.477(m) 0.027(m)
Z: 4784367.410(m) 0.030(m) 4784367.430(m) 0.030(m)

LAT: 48 54 19.87300 0.037(m) 48 54 19.88899 0.037(m)
E LON: 242 28 54.38203 0.006(m) 242 28 54.31589 0.006(m)
W LON: 117 31 5.61797 0.006(m) 117 31 5.68411 0.006(m)
EL HGT: 939.982(m) 0.025(m) 939.578(m) 0.025(m)
ORTHO HGT: 956.410(m) 0.030(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5417082.436 217105.963
Easting (X) [meters] 462023.981 742964.559
Convergence [degrees] -0.39055452 2.46816389
Point Scale 0.99961772 1.00003695
Combined Factor 0.99947049 0.99988966

US NATIONAL GRID DESIGNATOR: 11UMQ6202317082(NAD 83)



FILE: CNTR24.O00 OP1437418381166

6011 Warning - OPUS-RS was able to find a set of reference stations
6011 with data suitable for use with your dataset. However, your
6011 position does not fall within the polygon enclosing these reference
6011 stations. This means that the geographic interpolation algorithms
6011 performed within OPUS-RS must instead perform extrapolation.
6011 Extrapolation, especially if your position is far from the
6011 reference stations, is prone to error. Use this solution with
6011 caution.

p025
rkd1
drao
brew
mtfv

Your station is 0.4 KM outside the polygon enclosing the reference stations

NGS OPUS-RS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com DATE: July 20, 2015
RINEX FILE: 0000193q.15o TIME: 18:56:22 UTC

SOFTWARE: rsgps 1.37 RS50.prl 1.99.2 START: 2015/07/12 16:28:36
EPHEMERIS: igr18530.eph [rapid] STOP: 2015/07/12 16:58:37
NAV FILE: brdc1930.15n OBS USED: 1195 / 1405 : 85%
ANT NAME: LEIAT502 NONE QUALITY IND. 25.15/ 33.27
ARP HEIGHT: 1.371 NORMALIZED RMS: 0.277

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52794)

X: -1929940.524(m) 0.017(m) -1929941.424(m) 0.017(m)
Y: -3729555.823(m) 0.034(m) -3729554.635(m) 0.034(m)
Z: 4785699.680(m) 0.035(m) 4785699.699(m) 0.035(m)

LAT: 48 55 28.72325 0.009(m) 48 55 28.73931 0.009(m)
E LON: 242 38 22.93029 0.002(m) 242 38 22.86421 0.002(m)
W LON: 117 21 37.06971 0.002(m) 117 21 37.13579 0.002(m)
EL HGT: 852.881(m) 0.051(m) 852.474(m) 0.051(m)



ORTHO HGT: 869.227(m) 0.054(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 11) SPC (4601 WA N)

Northing (Y) [meters] 5419141.574 219741.223

Easting (X) [meters] 473607.248 754435.638

Convergence [degrees] -0.27161015 2.58574604

Point Scale 0.99960856 1.00004161

Combined Factor 0.99947497 0.99990796

US NATIONAL GRID DESIGNATOR: 11UMQ7360719141(NAD 83)



FILE: GCP04.tps OP1437122720566

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com DATE: July 17, 2015
RINEX FILE: gcp0196x.15o TIME: 08:48:33 UTC

SOFTWARE: rsgps 1.37 RS94.prl 1.99.2 START: 2015/07/15 23:23:49
EPHEMERIS: igr18533.eph [rapid] STOP: 2015/07/15 23:54:24
NAV FILE: brdc1960.15n OBS USED: 1068 / 1476 : 72%
ANT NAME: TPSHIPER_V NONE QUALITY IND. 33.79/ 23.07
ARP HEIGHT: 2.000 NORMALIZED RMS: 0.408

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53695)

X: -2008399.814(m) 0.018(m) -2008400.714(m) 0.018(m)
Y: -3723474.254(m) 0.030(m) -3723473.066(m) 0.030(m)
Z: 4758230.913(m) 0.040(m) 4758230.932(m) 0.040(m)

LAT: 48 33 1.29637 0.006(m) 48 33 1.31178 0.006(m)
E LON: 241 39 29.08644 0.005(m) 241 39 29.02032 0.005(m)
W LON: 118 20 30.91356 0.005(m) 118 20 30.97968 0.005(m)
EL HGT: 833.062(m) 0.052(m) 832.667(m) 0.052(m)
ORTHO HGT: 850.112(m) 0.055(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5378342.718 175353.625
Easting (X) [meters] 400969.194 683898.968
Convergence [degrees] -1.00590145 1.85490755
Point Scale 0.99972049 0.99997073
Combined Factor 0.99958998 0.99984019

US NATIONAL GRID DESIGNATOR: 11UMP0096978342(NAD 83)



FILE: GCP05.O00 OP1437417991800

NGS OPUS-RS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: 0000194s.15o

DATE: July 20, 2015
TIME: 18:50:13 UTC

SOFTWARE: rsgps 1.37 RS91.prl 1.99.2 START: 2015/07/13 18:13:14
EPHEMERIS: igr18531.eph [rapid] STOP: 2015/07/13 18:43:23
NAV FILE: brdc1940.15n OBS USED: 1422 / 1812 : 78%
ANT NAME: LEIAT502 NONE QUALITY IND. 29.75/ 4.71
ARP HEIGHT: 1.441 NORMALIZED RMS: 0.344

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53088)

X: -2004587.838(m) 0.021(m) -2004588.737(m) 0.021(m)
Y: -3730204.379(m) 0.035(m) -3730203.191(m) 0.035(m)
Z: 4754395.593(m) 0.041(m) 4754395.611(m) 0.041(m)

LAT: 48 29 59.17955 0.006(m) 48 29 59.19499 0.006(m)
E LON: 241 44 48.12666 0.004(m) 241 44 48.06070 0.004(m)
W LON: 118 15 11.87334 0.004(m) 118 15 11.93930 0.004(m)
EL HGT: 687.305(m) 0.057(m) 686.907(m) 0.057(m)
ORTHO HGT: 704.701(m) 0.059(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5372608.682 169947.096
Easting (X) [meters] 407417.022 690626.602
Convergence [degrees] -0.93872784 1.92088864
Point Scale 0.99970531 0.99996445
Combined Factor 0.99959764 0.99985675

US NATIONAL GRID DESIGNATOR: 11UMP0741772608(NAD 83)



FILE: GCP06.O00 OP1438069421078

NGS OPUS-RS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: gcp0205c.15o

DATE: July 28, 2015
TIME: 07:47:07 UTC

SOFTWARE: rsgps 1.37 RS50.prl 1.99.2 START: 2015/07/24 02:08:45
EPHEMERIS: igr18545.eph [rapid] STOP: 2015/07/24 02:39:05
NAV FILE: brdc2050.15n OBS USED: 1848 / 2317 : 80%
ANT NAME: LEIAT502 NONE QUALITY IND. 39.31/ 33.91
ARP HEIGHT: 1.581 NORMALIZED RMS: 0.318

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.55918)

X: -2013256.988(m) 0.028(m) -2013257.888(m) 0.028(m)
Y: -3718783.197(m) 0.048(m) -3718782.010(m) 0.048(m)
Z: 4760472.211(m) 0.051(m) 4760472.230(m) 0.051(m)

LAT: 48 34 33.42041 0.008(m) 48 34 33.43575 0.008(m)
E LON: 241 34 11.94452 0.005(m) 241 34 11.87836 0.005(m)
W LON: 118 25 48.05548 0.005(m) 118 25 48.12164 0.005(m)
EL HGT: 1310.265(m) 0.075(m) 1309.872(m) 0.075(m)
ORTHO HGT: 1327.112(m) 0.077(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5381305.007 177991.005
Easting (X) [meters] 394521.369 677309.704
Convergence [degrees] -1.07237168 1.78931904
Point Scale 0.99973669 0.99997421
Combined Factor 0.99953144 0.99976891

US NATIONAL GRID DESIGNATOR: 11ULP9452181305(NAD 83)



FILE: GCP09.O00 OP1438069568011

NGS OPUS-RS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: gcp0205b.15o

DATE: July 28, 2015
TIME: 07:48:58 UTC

SOFTWARE: rsgps 1.37 RS92.prl 1.99.2 START: 2015/07/24 01:14:09
EPHEMERIS: igr18545.eph [rapid] STOP: 2015/07/24 01:44:14
NAV FILE: brdc2050.15n OBS USED: 1080 / 1242 : 87%
ANT NAME: LEIAT502 NONE QUALITY IND. 13.89/ 19.39
ARP HEIGHT: 1.576 NORMALIZED RMS: 0.277

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.55907)

X: -2013124.273(m) 0.009(m) -2013125.173(m) 0.009(m)
Y: -3721219.648(m) 0.015(m) -3721218.461(m) 0.015(m)
Z: 4758363.825(m) 0.020(m) 4758363.844(m) 0.020(m)

LAT: 48 32 57.79416 0.007(m) 48 32 57.80950 0.007(m)
E LON: 241 35 14.18524 0.004(m) 241 35 14.11911 0.004(m)
W LON: 118 24 45.81476 0.004(m) 118 24 45.88089 0.004(m)
EL HGT: 1105.945(m) 0.025(m) 1105.552(m) 0.025(m)
ORTHO HGT: 1122.894(m) 0.031(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5378328.751 175078.704
Easting (X) [meters] 395742.001 678677.715
Convergence [degrees] -1.05897083 1.80219112
Point Scale 0.99973355 0.99997060
Combined Factor 0.99956030 0.99979731

US NATIONAL GRID DESIGNATOR: 11ULP9574278328(NAD 83)



FILE: GCP10.O00 OP1436893976974

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 14, 2015
RINEX FILE: gcp1194v.15o TIME: 18:51:24 UTC

SOFTWARE: rsgps 1.37 RS93.prl 1.99.2 START: 2015/07/13 21:28:57
EPHEMERIS: igr18531.eph [rapid] STOP: 2015/07/13 21:58:58
NAV FILE: brdc1940.15n OBS USED: 1440 / 1488 : 97%
ANT NAME: LEIAT502 NONE QUALITY IND. 44.91/ 38.99
ARP HEIGHT: 1.50 NORMALIZED RMS: 0.269

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53125)

X: -2008966.877(m) 0.019(m) -2008967.776(m) 0.019(m)
Y: -3727614.973(m) 0.035(m) -3727613.785(m) 0.035(m)
Z: 4754903.852(m) 0.044(m) 4754903.870(m) 0.044(m)

LAT: 48 30 15.04978 0.007(m) 48 30 15.06518 0.007(m)
E LON: 241 40 40.52731 0.003(m) 241 40 40.46131 0.003(m)
W LON: 118 19 19.47269 0.003(m) 118 19 19.53869 0.003(m)
EL HGT: 932.178(m) 0.059(m) 931.781(m) 0.059(m)
ORTHO HGT: 949.403(m) 0.061(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5373184.217 170268.936
Easting (X) [meters] 402344.896 685530.786
Convergence [degrees] -0.99031795 1.86968232
Point Scale 0.99971717 0.99996497
Combined Factor 0.99957114 0.99981890

US NATIONAL GRID DESIGNATOR: 11UMP0234473184(NAD 83)



FILE: GCP11.O00 OP1437029035600

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: gcp1195t.15o

DATE: July 16, 2015
TIME: 06:46:57 UTC

SOFTWARE: rsgps 1.37 RS92.prl 1.99.2 START: 2015/07/14 19:58:50
EPHEMERIS: igr18532.eph [rapid] STOP: 2015/07/14 20:29:16
NAV FILE: brdc1950.15n OBS USED: 1098 / 1182 : 93%
ANT NAME: LEIAT502 NONE QUALITY IND. 3.52/ 9.23
ARP HEIGHT: 1.313 NORMALIZED RMS: 0.324

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53382)

X: -2014497.588(m) 0.009(m) -2014498.488(m) 0.009(m)
Y: -3718835.497(m) 0.015(m) -3718834.310(m) 0.015(m)
Z: 4759882.966(m) 0.025(m) 4759882.985(m) 0.025(m)

LAT: 48 34 5.34767 0.009(m) 48 34 5.36300 0.009(m)
E LON: 241 33 19.95256 0.004(m) 241 33 19.88639 0.004(m)
W LON: 118 26 40.04744 0.004(m) 118 26 40.11361 0.004(m)
EL HGT: 1289.785(m) 0.029(m) 1289.392(m) 0.029(m)
ORTHO HGT: 1306.651(m) 0.033(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5380458.281 177091.124
Easting (X) [meters] 393439.745 676271.457
Convergence [degrees] -1.08307388 1.77856652
Point Scale 0.99973951 0.99997313
Combined Factor 0.99953747 0.99977104

US NATIONAL GRID DESIGNATOR: 11ULP9343980458(NAD 83)



FILE: GCP14.O00 OP1437418037765

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: 0000194w.15o

DATE: July 20, 2015
TIME: 18:50:12 UTC

SOFTWARE: rsgps 1.37 RS50.prl 1.99.2 START: 2015/07/13 22:13:07
EPHEMERIS: igr18531.eph [rapid] STOP: 2015/07/13 22:43:08
NAV FILE: brdc1940.15n OBS USED: 1302 / 1614 : 81%
ANT NAME: LEIAT502 NONE QUALITY IND. 27.25/ 14.96
ARP HEIGHT: 1.584 NORMALIZED RMS: 0.304

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53133)

X: -2007539.380(m) 0.019(m) -2007540.279(m) 0.019(m)
Y: -3729868.277(m) 0.033(m) -3729867.089(m) 0.033(m)
Z: 4753395.400(m) 0.042(m) 4753395.418(m) 0.042(m)

LAT: 48 29 11.00849 0.006(m) 48 29 11.02390 0.006(m)
E LON: 241 42 33.77568 0.006(m) 241 42 33.70972 0.006(m)
W LON: 118 17 26.22432 0.006(m) 118 17 26.29028 0.006(m)
EL HGT: 668.599(m) 0.056(m) 668.201(m) 0.056(m)
ORTHO HGT: 685.985(m) 0.059(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5371167.218 168368.238
Easting (X) [meters] 404635.122 687919.388
Convergence [degrees] -0.96648493 1.89310335
Point Scale 0.99971174 0.99996292
Combined Factor 0.99960700 0.99985815

US NATIONAL GRID DESIGNATOR: 11UMP0463571167(NAD 83)



FILE: GCP15.O00 OP1437418097932

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: 0000194u.15o

DATE: July 20, 2015
TIME: 18:51:09 UTC

SOFTWARE: rsgps 1.37 RS52.prl 1.99.2 START: 2015/07/13 20:45:39
EPHEMERIS: igr18531.eph [rapid] STOP: 2015/07/13 21:15:40
NAV FILE: brdc1940.15n OBS USED: 1440 / 1452 : 99%
ANT NAME: LEIAT502 NONE QUALITY IND. 13.26/ 17.89
ARP HEIGHT: 1.560 NORMALIZED RMS: 0.295

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53117)

X: -2011606.880(m) 0.016(m) -2011607.779(m) 0.016(m)
Y: -3725335.789(m) 0.027(m) -3725334.601(m) 0.027(m)
Z: 4755726.028(m) 0.037(m) 4755726.046(m) 0.037(m)

LAT: 48 30 50.92617 0.004(m) 48 30 50.94155 0.004(m)
E LON: 241 37 54.62471 0.005(m) 241 37 54.55867 0.005(m)
W LON: 118 22 5.37529 0.005(m) 118 22 5.44133 0.005(m)
EL HGT: 1049.511(m) 0.048(m) 1049.115(m) 0.048(m)
ORTHO HGT: 1066.607(m) 0.051(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5374351.786 171266.430
Easting (X) [meters] 398960.792 682091.797
Convergence [degrees] -1.02500116 1.83537180
Point Scale 0.99972543 0.99996616
Combined Factor 0.99956102 0.99980171

US NATIONAL GRID DESIGNATOR: 11ULP9896074351(NAD 83)



FILE: GCP16.O00 OP1437029070133

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: gcp1195r.15o

DATE: July 16, 2015
TIME: 06:48:13 UTC

SOFTWARE: rsgps 1.37 RS93.prl 1.99.2 START: 2015/07/14 17:39:25
EPHEMERIS: igr18532.eph [rapid] STOP: 2015/07/14 18:09:46
NAV FILE: brdc1950.15n OBS USED: 1428 / 1536 : 93%
ANT NAME: LEIAT502 NONE QUALITY IND. 27.58/ 18.10
ARP HEIGHT: 1.262 NORMALIZED RMS: 0.347

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53355)

X: -2014039.214(m) 0.026(m) -2014040.114(m) 0.026(m)
Y: -3722870.285(m) 0.038(m) -3722869.097(m) 0.038(m)
Z: 4756967.668(m) 0.042(m) 4756967.687(m) 0.042(m)

LAT: 48 31 42.09722 0.010(m) 48 31 42.11259 0.010(m)
E LON: 241 35 13.24354 0.006(m) 241 35 13.17742 0.006(m)
W LON: 118 24 46.75646 0.006(m) 118 24 46.82258 0.006(m)
EL HGT: 1309.164(m) 0.061(m) 1308.770(m) 0.061(m)
ORTHO HGT: 1326.140(m) 0.063(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5375991.919 172741.114
Easting (X) [meters] 395679.494 678731.937
Convergence [degrees] -1.05882366 1.80199637
Point Scale 0.99973371 0.99996790
Combined Factor 0.99952863 0.99976277

US NATIONAL GRID DESIGNATOR: 11ULP9567975991(NAD 83)



FILE: GCP17.O00 OP1437029105649

NGS OPUS-RS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: gcp1195q.15o

DATE: July 16, 2015
TIME: 06:48:00 UTC

SOFTWARE: rsgps 1.37 RS50.prl 1.99.2 START: 2015/07/14 16:54:07
EPHEMERIS: igr18532.eph [rapid] STOP: 2015/07/14 17:24:51
NAV FILE: brdc1950.15n OBS USED: 800 / 1015 : 79%
ANT NAME: LEIAT502 NONE QUALITY IND. 8.20/ 17.38
ARP HEIGHT: 1.275 NORMALIZED RMS: 0.369

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53347)

X: -2012961.714(m) 0.024(m) -2012962.614(m) 0.024(m)
Y: -3720940.402(m) 0.052(m) -3720939.215(m) 0.052(m)
Z: 4758595.436(m) 0.036(m) 4758595.455(m) 0.036(m)

LAT: 48 33 10.59216 0.020(m) 48 33 10.60751 0.020(m)
E LON: 241 35 14.67801 0.005(m) 241 35 14.61188 0.005(m)
W LON: 118 24 45.32199 0.005(m) 118 24 45.38812 0.005(m)
EL HGT: 1065.766(m) 0.065(m) 1065.373(m) 0.065(m)
ORTHO HGT: 1082.706(m) 0.067(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5378723.711 175474.134
Easting (X) [meters] 395759.406 678675.383
Convergence [degrees] -1.05892622 1.80229303
Point Scale 0.99973350 0.99997107
Combined Factor 0.99956654 0.99980407

US NATIONAL GRID DESIGNATOR: 11ULP9575978723(NAD 83)



FILE: GCP18.O00 OP1437418139142

NGS OPUS-RS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: 0000194s.15o

DATE: July 20, 2015
TIME: 18:52:11 UTC

SOFTWARE: rsgps 1.37 RS90.prl 1.99.2 START: 2015/07/13 18:58:42
EPHEMERIS: igr18531.eph [rapid] STOP: 2015/07/13 19:29:38
NAV FILE: brdc1940.15n OBS USED: 1752 / 1872 : 94%
ANT NAME: LEIAT502 NONE QUALITY IND. 22.68/ 5.67
ARP HEIGHT: 1.509 NORMALIZED RMS: 0.383

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53096)

X: -2006036.282(m) 0.013(m) -2006037.181(m) 0.013(m)
Y: -3729983.213(m) 0.037(m) -3729982.025(m) 0.037(m)
Z: 4753912.595(m) 0.024(m) 4753912.613(m) 0.024(m)

LAT: 48 29 36.91410 0.022(m) 48 29 36.92952 0.022(m)
E LON: 241 43 40.88929 0.023(m) 241 43 40.82332 0.023(m)
W LON: 118 16 19.11071 0.023(m) 118 16 19.17668 0.023(m)
EL HGT: 650.986(m) 0.033(m) 650.588(m) 0.033(m)
ORTHO HGT: 668.370(m) 0.037(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5371943.998 169213.650
Easting (X) [meters] 406025.917 689270.040
Convergence [degrees] -0.95262810 1.90698320
Point Scale 0.99970850 0.99996374
Combined Factor 0.99960652 0.99986173

US NATIONAL GRID DESIGNATOR: 11UMP0602571943(NAD 83)



FILE: GCP41.tps OP1436894885011

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 14, 2015
RINEX FILE: gcp4194r.15o TIME: 19:03:47 UTC

SOFTWARE: rsgps 1.37 RS94.prl 1.99.2 START: 2015/07/13 17:50:41
EPHEMERIS: igr18531.eph [rapid] STOP: 2015/07/13 18:21:13
NAV FILE: brdc1940.15n OBS USED: 3552 / 3784 : 94%
ANT NAME: TPSHIPPER_V NONE QUALITY IND. 40.22/ 47.18
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.263

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53083)

X: -1965292.216(m) 0.006(m) -1965293.114(m) 0.006(m)
Y: -3761549.033(m) 0.014(m) -3761547.841(m) 0.014(m)
Z: 4746484.380(m) 0.011(m) 4746484.395(m) 0.011(m)

LAT: 48 23 24.09989 0.007(m) 48 23 24.11572 0.007(m)
E LON: 242 24 51.60286 0.007(m) 242 24 51.53735 0.007(m)
W LON: 117 35 8.39714 0.007(m) 117 35 8.46265 0.007(m)
EL HGT: 934.336(m) 0.016(m) 933.922(m) 0.016(m)
ORTHO HGT: 951.389(m) 0.024(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5359817.353 159622.645
Easting (X) [meters] 456642.364 740443.347
Convergence [degrees] -0.43789892 2.41795444
Point Scale 0.99962310 0.99995352
Combined Factor 0.99947674 0.99980711

US NATIONAL GRID DESIGNATOR: 11UMP5664259817(NAD 83)



FILE: GCP42.tps OP1436894909115

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 14, 2015
RINEX FILE: gcp4194t.15o TIME: 19:02:29 UTC

SOFTWARE: rsgps 1.37 RS90.prl 1.99.2 START: 2015/07/13 19:43:26
EPHEMERIS: igr18531.eph [rapid] STOP: 2015/07/13 20:14:14
NAV FILE: brdc1940.15n OBS USED: 1925 / 2072 : 93%
ANT NAME: TPSHIPER_V NONE QUALITY IND. 8.15/ 12.69
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.296

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53105)

X: -1960935.530(m) 0.009(m) -1960936.427(m) 0.009(m)
Y: -3765993.131(m) 0.009(m) -3765991.939(m) 0.009(m)
Z: 4745504.649(m) 0.019(m) 4745504.663(m) 0.019(m)

LAT: 48 22 16.44282 0.009(m) 48 22 16.45867 0.009(m)
E LON: 242 29 39.16176 0.007(m) 242 29 39.09637 0.007(m)
W LON: 117 30 20.83824 0.007(m) 117 30 20.90363 0.007(m)
EL HGT: 1480.823(m) 0.020(m) 1480.407(m) 0.020(m)
ORTHO HGT: 1497.689(m) 0.026(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5357686.276 157787.524
Easting (X) [meters] 462541.996 746443.819
Convergence [degrees] -0.37806333 2.47742484
Point Scale 0.99961724 0.99995201
Combined Factor 0.99938530 0.99971999

US NATIONAL GRID DESIGNATOR: 11UMP6254157686(NAD 83)



FILE: GCP48.tps OP1437029291832

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: gcp4195u.15o

DATE: July 16, 2015
TIME: 06:52:35 UTC

SOFTWARE: rsgps 1.37 RS50.prl 1.99.2 START: 2015/07/14 20:40:27
EPHEMERIS: igr18532.eph [rapid] STOP: 2015/07/14 21:11:17
NAV FILE: brdc1950.15n OBS USED: 1476 / 1638 : 90%
ANT NAME: TPSHIPER_V NONE QUALITY IND. 6.46/ 17.43
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.376

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53390)

X:	-1949865.910(m)	0.020(m)	-1949866.807(m)	0.020(m)
Y:	-3767876.357(m)	0.037(m)	-3767875.165(m)	0.037(m)
Z:	4747530.823(m)	0.044(m)	4747530.837(m)	0.044(m)

LAT:	48 24 22.97210	0.008(m)	48 24 22.98805	0.008(m)
E LON:	242 38 18.80296	0.006(m)	242 38 18.73760	0.006(m)
W LON:	117 21 41.19704	0.006(m)	117 21 41.26240	0.006(m)
EL HGT:	718.920(m)	0.060(m)	718.502(m)	0.060(m)
ORTHO HGT:	735.921(m)	0.063(m)	[NAVD88 (Computed using GEOID12B)]	

UTM COORDINATES	STATE PLANE COORDINATES	
UTM (Zone 11)	SPC (4601 WA N)	
Northing (Y) [meters]	5361532.506	162163.905
Easting (X) [meters]	473250.381	756950.891
Convergence [degrees]	-0.27031517	2.58489246
Point Scale	0.99960879	0.99995491
Combined Factor	0.99949617	0.99984226

US NATIONAL GRID DESIGNATOR: 11UMP7325061532(NAD 83)



FILE: GCP49.tps OP1437029314380

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: gcp4195w.15o

DATE: July 16, 2015
TIME: 06:53:21 UTC

SOFTWARE: rsgps 1.37 RS93.prl 1.99.2 START: 2015/07/14 22:20:40
EPHEMERIS: igr18532.eph [rapid] STOP: 2015/07/14 22:50:23
NAV FILE: brdc1950.15n OBS USED: 1584 / 1952 : 81%
ANT NAME: TPSHIPPER_V NONE QUALITY IND. 6.66/ 20.06
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.312

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53409)

X: -1954537.353(m) 0.013(m) -1954538.250(m) 0.013(m)
Y: -3767888.614(m) 0.033(m) -3767887.422(m) 0.033(m)
Z: 4746060.910(m) 0.038(m) 4746060.924(m) 0.038(m)

LAT: 48 22 59.09895 0.006(m) 48 22 59.11486 0.006(m)
E LON: 242 34 57.46924 0.008(m) 242 34 57.40387 0.008(m)
W LON: 117 25 2.53076 0.008(m) 117 25 2.59613 0.008(m)
EL HGT: 1053.984(m) 0.051(m) 1053.566(m) 0.051(m)
ORTHO HGT: 1070.918(m) 0.054(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5358963.886 159390.646
Easting (X) [meters] 469097.325 752929.558
Convergence [degrees] -0.31202886 2.54325439
Point Scale 0.99961173 0.99995295
Combined Factor 0.99944664 0.99978780

US NATIONAL GRID DESIGNATOR: 11UMP6909758963(NAD 83)



FILE: GCP50.O00 OP1436811414313

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 13, 2015
RINEX FILE: gcp5192s.15o TIME: 19:29:24 UTC

SOFTWARE: rsgps 1.37 RS92.prl 1.99.2 START: 2015/07/11 18:11:58
EPHEMERIS: igr18526.eph [rapid] STOP: 2015/07/11 18:43:59
NAV FILE: brdc1920.15n OBS USED: 3736 / 3816 : 98%
ANT NAME: LEIAT502 NONE QUALITY IND. 28.80/ 39.86
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.295

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52540)

X: -1943087.649(m) 0.005(m) -1943088.547(m) 0.005(m)
Y: -3757330.404(m) 0.012(m) -3757329.213(m) 0.012(m)
Z: 4758438.436(m) 0.010(m) 4758438.452(m) 0.010(m)

LAT: 48 33 19.53414 0.005(m) 48 33 19.55015 0.005(m)
E LON: 242 39 16.00080 0.004(m) 242 39 15.93522 0.004(m)
W LON: 117 20 43.99920 0.004(m) 117 20 44.06478 0.004(m)
EL HGT: 612.379(m) 0.015(m) 611.964(m) 0.015(m)
ORTHO HGT: 629.253(m) 0.022(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5378094.170 178773.194
Easting (X) [meters] 474501.048 757375.103
Convergence [degrees] -0.25902841 2.59672161
Point Scale 0.99960799 0.99997140
Combined Factor 0.99951206 0.99987544

US NATIONAL GRID DESIGNATOR: 11UMP7450178094(NAD 83)



FILE: GCP52.O00 OP1438567274367

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com DATE: August 03, 2015
RINEX FILE: gcp5193t.15o TIME: 02:05:52 UTC

SOFTWARE: rsgps 1.37 RS93.prl 1.99.2 START: 2015/07/12 19:39:56
EPHEMERIS: igs18530.eph [precise] STOP: 2015/07/12 20:10:19
NAV FILE: brdc1930.15n OBS USED: 1414 / 1883 : 75%
ANT NAME: LEIAT502 NONE QUALITY IND. 8.36/ 14.81
ARP HEIGHT: 1.473 NORMALIZED RMS: 0.372

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52830)

X: -1950814.581(m) 0.018(m) -1950815.479(m) 0.018(m)
Y: -3754112.290(m) 0.046(m) -3754111.099(m) 0.046(m)
Z: 4758468.088(m) 0.061(m) 4758468.104(m) 0.061(m)

LAT: 48 33 3.20615 0.007(m) 48 33 3.22209 0.007(m)
E LON: 242 32 29.30803 0.007(m) 242 32 29.24241 0.007(m)
W LON: 117 27 30.69197 0.007(m) 117 27 30.75759 0.007(m)
EL HGT: 1097.383(m) 0.078(m) 1096.969(m) 0.078(m)
ORTHO HGT: 1114.164(m) 0.080(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5377633.864 177897.631
Easting (X) [meters] 466161.832 749066.188
Convergence [degrees] -0.34368830 2.51261300
Point Scale 0.99961407 0.99997080
Combined Factor 0.99944218 0.99979885

US NATIONAL GRID DESIGNATOR: 11UMP6616177633(NAD 83)



FILE: GCP54.tps OP1437635301798

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: gcp5202a.15o

DATE: July 23, 2015
TIME: 07:12:22 UTC

SOFTWARE: rsgps 1.37 RS53.prl 1.99.2 START: 2015/07/21 00:31:14
EPHEMERIS: igr18542.eph [rapid] STOP: 2015/07/21 01:02:11
NAV FILE: brdc2020.15n OBS USED: 2216 / 2704 : 82%
ANT NAME: TPSHIPPER_V NONE QUALITY IND. 24.54/ 16.58
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.407

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.55077)

X: -1954694.204(m) 0.012(m) -1954695.103(m) 0.012(m)
Y: -3746921.329(m) 0.027(m) -3746920.139(m) 0.027(m)
Z: 4762313.542(m) 0.024(m) 4762313.559(m) 0.024(m)

LAT: 48 36 16.87959 0.009(m) 48 36 16.89548 0.009(m)
E LON: 242 26 59.45309 0.003(m) 242 26 59.38732 0.003(m)
W LON: 117 33 0.54691 0.003(m) 117 33 0.61268 0.003(m)
EL HGT: 946.448(m) 0.037(m) 946.038(m) 0.037(m)
ORTHO HGT: 963.312(m) 0.041(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5383658.491 183581.954
Easting (X) [meters] 459443.091 742053.033
Convergence [degrees] -0.41271041 2.44439530
Point Scale 0.99962021 0.99997835
Combined Factor 0.99947196 0.99983005

US NATIONAL GRID DESIGNATOR: 11UMP5944383658(NAD 83)



FILE: GCP55.O00 OP1436813577449

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 13, 2015
RINEX FILE: gcp5192v.15o TIME: 20:04:28 UTC

SOFTWARE: rsgps 1.37 RS90.prl 1.99.2 START: 2015/07/11 21:40:27
EPHEMERIS: igr18526.eph [rapid] STOP: 2015/07/11 22:10:42
NAV FILE: brdc1920.15n OBS USED: 1708 / 1708 : 100%
ANT NAME: LEIAT502 NONE QUALITY IND. 45.89/ 15.28
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.269

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52579)

X: -1950371.628(m) 0.017(m) -1950372.527(m) 0.017(m)
Y: -3745076.332(m) 0.026(m) -3745075.142(m) 0.026(m)
Z: 4765541.995(m) 0.033(m) 4765542.012(m) 0.033(m)

LAT: 48 38 54.22081 0.004(m) 48 38 54.23673 0.004(m)
E LON: 242 29 24.97728 0.003(m) 242 29 24.91148 0.003(m)
W LON: 117 30 35.02272 0.003(m) 117 30 35.08852 0.003(m)
EL HGT: 967.168(m) 0.045(m) 966.758(m) 0.045(m)
ORTHO HGT: 984.021(m) 0.049(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5388496.051 188565.465
Easting (X) [meters] 462455.506 744821.577
Convergence [degrees] -0.38264205 2.47449133
Point Scale 0.99961732 0.99998514
Combined Factor 0.99946583 0.99983359

US NATIONAL GRID DESIGNATOR: 11UMP6245588496(NAD 83)



FILE: GCP56.O00 OP1436815065757

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 13, 2015
RINEX FILE: gcp5192x.15o TIME: 20:26:50 UTC

SOFTWARE: rsgps 1.37 RS92.prl 1.99.2 START: 2015/07/11 23:07:58
EPHEMERIS: igr18526.eph [rapid] STOP: 2015/07/11 23:35:02
NAV FILE: brdc1920.15n OBS USED: 1827 / 2240 : 82%
ANT NAME: LEIAT502 NONE QUALITY IND. 29.47/ 41.93
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.248

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52595)

X: -1954278.915(m) 0.005(m) -1954279.814(m) 0.005(m)
Y: -3746527.232(m) 0.009(m) -3746526.042(m) 0.009(m)
Z: 4762797.469(m) 0.013(m) 4762797.486(m) 0.013(m)

LAT: 48 36 40.38574 0.005(m) 48 36 40.40163 0.005(m)
E LON: 242 27 8.52835 0.002(m) 242 27 8.46257 0.002(m)
W LON: 117 32 51.47165 0.002(m) 117 32 51.53743 0.002(m)
EL HGT: 951.456(m) 0.016(m) 951.046(m) 0.016(m)
ORTHO HGT: 968.315(m) 0.023(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5384382.954 184315.302
Easting (X) [meters] 459634.134 742207.783
Convergence [degrees] -0.41086050 2.44627216
Point Scale 0.99962002 0.99997933
Combined Factor 0.99947099 0.99983024

US NATIONAL GRID DESIGNATOR: 11UMP5963484382(NAD 83)



FILE: GCP57.O00 OP1436815340964

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 13, 2015
RINEX FILE: gcp_192t.15o TIME: 20:31:48 UTC

SOFTWARE: rsgps 1.37 RS93.prl 1.99.2 START: 2015/07/11 19:10:55
EPHEMERIS: igr18526.eph [rapid] STOP: 2015/07/11 19:40:59
NAV FILE: brdc1920.15n OBS USED: 1460 / 1525 : 96%
ANT NAME: LEIAT502 NONE QUALITY IND. 29.93/ 20.03
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.271

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52551)

X: -1943954.677(m) 0.007(m) -1943955.576(m) 0.007(m)
Y: -3745081.453(m) 0.011(m) -3745080.263(m) 0.011(m)
Z: 4767879.524(m) 0.013(m) 4767879.541(m) 0.013(m)

LAT: 48 40 56.02735 0.001(m) 48 40 56.04332 0.001(m)
E LON: 242 34 3.30658 0.005(m) 242 34 3.24077 0.005(m)
W LON: 117 25 56.69342 0.005(m) 117 25 56.75923 0.005(m)
EL HGT: 770.290(m) 0.018(m) 769.879(m) 0.018(m)
ORTHO HGT: 787.184(m) 0.025(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5392221.964 192573.141
Easting (X) [meters] 468171.411 750346.729
Convergence [degrees] -0.32477194 2.53205295
Point Scale 0.99961245 0.99999079
Combined Factor 0.99949179 0.99987009

US NATIONAL GRID DESIGNATOR: 11UMP6817192221(NAD 83)



FILE: GCP58.O00 OP1436815745518

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 13, 2015
RINEX FILE: gcp5192u.15o TIME: 20:33:27 UTC

SOFTWARE: rsgps 1.37 RS90.prl 1.99.2 START: 2015/07/11 20:14:22
EPHEMERIS: igr18526.eph [rapid] STOP: 2015/07/11 20:42:05
NAV FILE: brdc1920.15n OBS USED: 655 / 915 : 72%
ANT NAME: LEIAT502 NONE QUALITY IND. 5.01/ 12.47
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.257

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52562)

X: -1946603.855(m) 0.015(m) -1946604.754(m) 0.015(m)
Y: -3744626.075(m) 0.025(m) -3744624.885(m) 0.025(m)
Z: 4767426.927(m) 0.034(m) 4767426.944(m) 0.034(m)

LAT: 48 40 26.49141 0.004(m) 48 40 26.50736 0.004(m)
E LON: 242 31 58.13696 0.003(m) 242 31 58.07115 0.003(m)
W LON: 117 28 1.86304 0.003(m) 117 28 1.92885 0.003(m)
EL HGT: 969.896(m) 0.045(m) 969.486(m) 0.045(m)
ORTHO HGT: 986.773(m) 0.048(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5391325.062 191549.132
Easting (X) [meters] 465606.580 747828.841
Convergence [degrees] -0.35084232 2.50616647
Point Scale 0.99961453 0.99998939
Combined Factor 0.99946261 0.99983741

US NATIONAL GRID DESIGNATOR: 11UMP6560691325(NAD 83)



FILE: GCP59.O00 OP1438567354310

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com DATE: August 03, 2015
RINEX FILE: gcp5193w.15o TIME: 02:07:03 UTC

SOFTWARE: rsgps 1.37 RS54.prl 1.99.2 START: 2015/07/12 22:22:47
EPHEMERIS: igs18530.eph [precise] STOP: 2015/07/12 22:55:07
NAV FILE: brdc1930.15n OBS USED: 1967 / 2142 : 92%
ANT NAME: LEIAT502 NONE QUALITY IND. 16.19/ 27.89
ARP HEIGHT: 1.582 NORMALIZED RMS: 0.331

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52861)

X: -1946872.747(m) 0.018(m) -1946873.645(m) 0.018(m)
Y: -3753740.010(m) 0.033(m) -3753738.819(m) 0.033(m)
Z: 4760037.558(m) 0.041(m) 4760037.574(m) 0.041(m)

LAT: 48 34 28.91764 0.010(m) 48 34 28.93360 0.010(m)
E LON: 242 35 11.55133 0.010(m) 242 35 11.48570 0.010(m)
W LON: 117 24 48.44867 0.010(m) 117 24 48.51430 0.010(m)
EL HGT: 853.343(m) 0.054(m) 852.929(m) 0.054(m)
ORTHO HGT: 870.168(m) 0.057(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5380261.389 180689.338
Easting (X) [meters] 469502.030 752272.459
Convergence [degrees] -0.31002100 2.54616673
Point Scale 0.99961143 0.99997403
Combined Factor 0.99947776 0.99984031

US NATIONAL GRID DESIGNATOR: 11UMP6950280261(NAD 83)



FILE: GCP60.O00 OP1436817888057

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 13, 2015
RINEX FILE: gcp6193q.15o TIME: 21:13:10 UTC

SOFTWARE: rsgps 1.37 RS91.prl 1.99.2 START: 2015/07/12 16:35:04
EPHEMERIS: igr18530.eph [rapid] STOP: 2015/07/12 17:05:09
NAV FILE: brdc1930.15n OBS USED: 1325 / 1435 : 92%
ANT NAME: LEIAT502 NONE QUALITY IND. 26.74/ 18.79
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.236

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52795)

X: -1969858.610(m) 0.008(m) -1969859.509(m) 0.008(m)
Y: -3738129.487(m) 0.019(m) -3738128.298(m) 0.019(m)
Z: 4762580.881(m) 0.020(m) 4762580.899(m) 0.020(m)

LAT: 48 36 40.68549 0.003(m) 48 36 40.70124 0.003(m)
E LON: 242 12 44.62726 0.004(m) 242 12 44.56138 0.004(m)
W LON: 117 47 15.37274 0.004(m) 117 47 15.43862 0.004(m)
EL HGT: 654.604(m) 0.028(m) 654.199(m) 0.028(m)
ORTHO HGT: 671.746(m) 0.033(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5384546.845 183596.847
Easting (X) [meters] 441945.979 724527.280
Convergence [degrees] -0.59090927 2.26760774
Point Scale 0.99964141 0.99997934
Combined Factor 0.99953887 0.99987676

US NATIONAL GRID DESIGNATOR: 11UMP4194584546(NAD 83)



FILE: GCP61.O00 OP1436824998859

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 13, 2015
RINEX FILE: gcp6193r.15o TIME: 22:32:40 UTC

SOFTWARE: rsgps 1.37 RS93.prl 1.99.2 START: 2015/07/12 17:19:57
EPHEMERIS: igr18530.eph [rapid] STOP: 2015/07/12 17:50:01
NAV FILE: brdc1930.15n OBS USED: 1314 / 1956 : 67%
ANT NAME: LEIAT502 NONE QUALITY IND. 21.58/ 8.59
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.269

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52803)

X: -1967282.853(m) 0.006(m) -1967283.752(m) 0.006(m)
Y: -3736508.726(m) 0.012(m) -3736507.537(m) 0.012(m)
Z: 4764978.781(m) 0.010(m) 4764978.799(m) 0.010(m)

LAT: 48 38 35.98112 0.007(m) 48 38 35.99689 0.007(m)
E LON: 242 13 59.02625 0.005(m) 242 13 58.96033 0.005(m)
W LON: 117 46 0.97375 0.005(m) 117 46 1.03967 0.005(m)
EL HGT: 712.841(m) 0.015(m) 712.436(m) 0.015(m)
ORTHO HGT: 729.879(m) 0.022(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5388091.311 187215.890
Easting (X) [meters] 443505.043 725908.108
Convergence [degrees] -0.57568657 2.28299428
Point Scale 0.99963921 0.99998432
Combined Factor 0.99952755 0.99987262

US NATIONAL GRID DESIGNATOR: 11UMP4350588091(NAD 83)



FILE: GCP62.O00 OP1436819084960

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 13, 2015
RINEX FILE: gcp6193s.15o TIME: 21:45:44 UTC

SOFTWARE: rsgps 1.37 RS93.prl 1.99.2 START: 2015/07/12 18:58:28
EPHEMERIS: igr18530.eph [rapid] STOP: 2015/07/12 19:29:36
NAV FILE: brdc1930.15n OBS USED: 1692 / 1890 : 90%
ANT NAME: LEIAT502 NONE QUALITY IND. 17.51/ 11.70
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.355

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52822)

X: -1964768.800(m) 0.012(m) -1964769.699(m) 0.012(m)
Y: -3734042.118(m) 0.023(m) -3734040.929(m) 0.023(m)
Z: 4768032.869(m) 0.024(m) 4768032.887(m) 0.024(m)

LAT: 48 41 2.78425 0.006(m) 48 41 2.80004 0.006(m)
E LON: 242 14 51.59823 0.004(m) 242 14 51.53227 0.004(m)
W LON: 117 45 8.40177 0.004(m) 117 45 8.46773 0.004(m)
EL HGT: 790.963(m) 0.034(m) 790.558(m) 0.034(m)
ORTHO HGT: 807.906(m) 0.038(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5392613.458 191789.888
Easting (X) [meters] 444625.454 726801.894
Convergence [degrees] -0.56507794 2.29386676
Point Scale 0.99963767 0.99999111
Combined Factor 0.99951377 0.99986717

US NATIONAL GRID DESIGNATOR: 11UMP4462592613(NAD 83)



FILE: GCP63.O00 OP1436819104283

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com
RINEX FILE: gcp6193t.15o

DATE: July 13, 2015
TIME: 21:48:20 UTC

SOFTWARE: rsgps 1.37 RS91.prl 1.99.2 START: 2015/07/12 19:40:58
EPHEMERIS: igr18530.eph [rapid] STOP: 2015/07/12 20:11:01
NAV FILE: brdc1930.15n OBS USED: 1764 / 1834 : 96%
ANT NAME: LEIAT502 NONE QUALITY IND. 14.23/ 19.68
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.286

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52830)

X: -1960861.795(m) 0.007(m) -1960862.694(m) 0.007(m)
Y: -3733736.945(m) 0.011(m) -3733735.756(m) 0.011(m)
Z: 4769864.282(m) 0.011(m) 4769864.300(m) 0.011(m)

LAT: 48 42 32.68657 0.006(m) 48 42 32.70239 0.006(m)
E LON: 242 17 33.75472 0.004(m) 242 17 33.68875 0.004(m)
W LON: 117 42 26.24528 0.004(m) 117 42 26.31125 0.004(m)
EL HGT: 788.547(m) 0.016(m) 788.141(m) 0.016(m)
ORTHO HGT: 805.431(m) 0.023(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5395357.680 194698.377
Easting (X) [meters] 447966.541 730003.097
Convergence [degrees] -0.53144770 2.32740254
Point Scale 0.99963326 0.99999553
Combined Factor 0.99950974 0.99987197

US NATIONAL GRID DESIGNATOR: 11UMP4796695357(NAD 83)



FILE: GCP64.O00 OP1436820091384

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 13, 2015
RINEX FILE: gcp6193u.15o TIME: 22:00:28 UTC

SOFTWARE: rsgps 1.37 RS94.prl 1.99.2 START: 2015/07/12 20:25:28
EPHEMERIS: igr18530.eph [rapid] STOP: 2015/07/12 20:55:32
NAV FILE: brdc1930.15n OBS USED: 1098 / 1296 : 85%
ANT NAME: LEIAT502 NONE QUALITY IND. 13.66/ 16.61
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.328

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52839)

X: -1953312.239(m) 0.014(m) -1953313.139(m) 0.014(m)
Y: -3728257.317(m) 0.026(m) -3728256.129(m) 0.026(m)
Z: 4776947.405(m) 0.029(m) 4776947.424(m) 0.029(m)

LAT: 48 48 27.29777 0.004(m) 48 48 27.31363 0.004(m)
E LON: 242 20 56.44921 0.004(m) 242 20 56.38312 0.004(m)
W LON: 117 39 3.55079 0.004(m) 117 39 3.61688 0.004(m)
EL HGT: 603.730(m) 0.041(m) 603.326(m) 0.041(m)
ORTHO HGT: 620.621(m) 0.044(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5406270.358 205812.902
Easting (X) [meters] 452202.204 733690.556
Convergence [degrees] -0.48987779 2.36932203
Point Scale 0.99962807 1.00001481
Combined Factor 0.99953350 0.99992020

US NATIONAL GRID DESIGNATOR: 11UMQ5220206270(NAD 83)



FILE: GCP65.O00 OP1438566751582

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com DATE: August 03, 2015
RINEX FILE: gcp6192w.15o TIME: 01:55:21 UTC

SOFTWARE: rsgps 1.37 RS50.prl 1.99.2 START: 2015/07/11 22:07:20
EPHEMERIS: igs18526.eph [precise] STOP: 2015/07/11 22:38:23
NAV FILE: brdc1920.15n OBS USED: 1242 / 1548 : 80%
ANT NAME: LEIAT502 NONE QUALITY IND. 31.57/ 28.88
ARP HEIGHT: 1.596 NORMALIZED RMS: 0.322

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52584)

X: -1964209.987(m) 0.019(m) -1964210.886(m) 0.019(m)
Y: -3741450.292(m) 0.036(m) -3741449.103(m) 0.036(m)
Z: 4762609.614(m) 0.044(m) 4762609.631(m) 0.044(m)

LAT: 48 36 33.78278 0.005(m) 48 36 33.79857 0.005(m)
E LON: 242 18 4.12000 0.002(m) 242 18 4.05417 0.002(m)
W LON: 117 41 55.88000 0.002(m) 117 41 55.94583 0.002(m)
EL HGT: 880.837(m) 0.059(m) 880.430(m) 0.059(m)
ORTHO HGT: 897.853(m) 0.062(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5384270.046 183646.507
Easting (X) [meters] 448485.573 731074.782
Convergence [degrees] -0.52430644 2.33368242
Point Scale 0.99963260 0.99997905
Combined Factor 0.99949462 0.99984103

US NATIONAL GRID DESIGNATOR: 11UMP4848584270(NAD 83)



FILE: GCP66.O00 OP1438566822996

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com DATE: August 03, 2015
RINEX FILE: gcp6192u.15o TIME: 01:56:55 UTC

SOFTWARE: rsgps 1.37 RS92.prl 1.99.2 START: 2015/07/11 20:04:18
EPHEMERIS: igs18526.eph [precise] STOP: 2015/07/11 20:36:01
NAV FILE: brdc1920.15n OBS USED: 1134 / 1722 : 66%
ANT NAME: LEIAT502 NONE QUALITY IND. 10.66/ 15.18
ARP HEIGHT: 1.566 NORMALIZED RMS: 0.232

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52561)

X: -1960852.479(m) 0.009(m) -1960853.378(m) 0.009(m)
Y: -3743537.989(m) 0.025(m) -3743536.799(m) 0.025(m)
Z: 4762420.245(m) 0.044(m) 4762420.262(m) 0.044(m)

LAT: 48 36 22.69639 0.012(m) 48 36 22.71222 0.012(m)
E LON: 242 21 16.58013 0.006(m) 242 21 16.51431 0.006(m)
W LON: 117 38 43.41987 0.006(m) 117 38 43.48569 0.006(m)
EL HGT: 930.286(m) 0.050(m) 929.877(m) 0.050(m)
ORTHO HGT: 947.242(m) 0.053(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5383893.050 183466.249
Easting (X) [meters] 452423.416 735027.902
Convergence [degrees] -0.48417348 2.37348533
Point Scale 0.99962781 0.99997859
Combined Factor 0.99948209 0.99983282

US NATIONAL GRID DESIGNATOR: 11UMP5242383893(NAD 83)



FILE: GCP67.O00 OP1438566952619

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com DATE: August 03, 2015
RINEX FILE: gcp6192s.15o TIME: 01:59:31 UTC

SOFTWARE: rsgps 1.37 RS52.prl 1.99.2 START: 2015/07/11 18:42:14
EPHEMERIS: igs18526.eph [precise] STOP: 2015/07/11 19:20:31
NAV FILE: brdc1920.15n OBS USED: 2380 / 3066 : 78%
ANT NAME: LEIAT502 NONE QUALITY IND. 25.48/ 19.71
ARP HEIGHT: 1.571 NORMALIZED RMS: 0.341

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52546)

X: -1957282.438(m) 0.020(m) -1957283.337(m) 0.020(m)
Y: -3744148.206(m) 0.033(m) -3744147.016(m) 0.033(m)
Z: 4763709.556(m) 0.043(m) 4763709.573(m) 0.043(m)

LAT: 48 37 17.35340 0.005(m) 48 37 17.36926 0.005(m)
E LON: 242 24 4.79996 0.007(m) 242 24 4.73415 0.007(m)
W LON: 117 35 55.20004 0.007(m) 117 35 55.26585 0.007(m)
EL HGT: 1160.767(m) 0.057(m) 1160.358(m) 0.057(m)
ORTHO HGT: 1177.611(m) 0.060(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5385552.636 185296.805
Easting (X) [meters] 455881.262 738399.905
Convergence [degrees] -0.44922215 2.40827507
Point Scale 0.99962391 0.99998089
Combined Factor 0.99944210 0.99979901

US NATIONAL GRID DESIGNATOR: 11UMP5588185552(NAD 83)



FILE: GCP68.O00 OP1436891592038

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com
RINEX FILE: gcp6194t.15o

DATE: July 14, 2015
TIME: 18:05:21 UTC

SOFTWARE: rsgps 1.37 RS94.prl 1.99.2 START: 2015/07/13 19:02:04
EPHEMERIS: igr18531.eph [rapid] STOP: 2015/07/13 19:38:29
NAV FILE: brdc1940.15n OBS USED: 1128 / 1656 : 68%
ANT NAME: LEIAT502 NONE QUALITY IND. 20.27/ 16.81
ARP HEIGHT: 1.541 NORMALIZED RMS: 0.321

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53097)

X: -1955775.098(m) 0.009(m) -1955775.997(m) 0.009(m)
Y: -3737039.244(m) 0.014(m) -3737038.055(m) 0.014(m)
Z: 4769426.142(m) 0.022(m) 4769426.160(m) 0.022(m)

LAT: 48 42 9.63843 0.009(m) 48 42 9.65429 0.009(m)
E LON: 242 22 29.06941 0.009(m) 242 22 29.00350 0.009(m)
W LON: 117 37 30.93059 0.009(m) 117 37 30.99650 0.009(m)
EL HGT: 830.815(m) 0.024(m) 830.409(m) 0.024(m)
ORTHO HGT: 847.634(m) 0.030(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5394593.282 194235.428
Easting (X) [meters] 453995.538 736064.927
Convergence [degrees] -0.46976176 2.38847692
Point Scale 0.99962600 0.99999438
Combined Factor 0.99949586 0.99986419

US NATIONAL GRID DESIGNATOR: 11UMP5399594593(NAD 83)



FILE: GCP69.O00 OP1436893883652

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com
RINEX FILE: gcp6194r.15o

DATE: July 14, 2015
TIME: 18:47:50 UTC

SOFTWARE: rsgps 1.37 RS92.prl 1.99.2 START: 2015/07/13 17:30:16
EPHEMERIS: igr18531.eph [rapid] STOP: 2015/07/13 18:01:21
NAV FILE: brdc1940.15n OBS USED: 1278 / 2160 : 59%
ANT NAME: LEIAT502 NONE QUALITY IND. 25.18/ 33.19
ARP HEIGHT: 1.478 NORMALIZED RMS: 0.312

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53079)

X: -1953643.626(m) 0.006(m) -1953644.525(m) 0.006(m)
Y: -3740722.316(m) 0.013(m) -3740721.127(m) 0.013(m)
Z: 4767840.096(m) 0.016(m) 4767840.113(m) 0.016(m)

LAT: 48 40 40.40259 0.009(m) 48 40 40.41846 0.009(m)
E LON: 242 25 24.84126 0.003(m) 242 25 24.77541 0.003(m)
W LON: 117 34 35.15874 0.003(m) 117 34 35.22459 0.003(m)
EL HGT: 1142.169(m) 0.019(m) 1141.760(m) 0.019(m)
ORTHO HGT: 1158.943(m) 0.026(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5391809.609 191632.341
Easting (X) [meters] 457567.119 739772.227
Convergence [degrees] -0.43291300 2.42482851
Point Scale 0.99962212 0.99999005
Combined Factor 0.99944322 0.99981108

US NATIONAL GRID DESIGNATOR: 11UMP5756791809(NAD 83)



FILE: GCP70.tps OP1437417773143

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: gpc7196b.15o

DATE: July 20, 2015
TIME: 18:46:31 UTC

SOFTWARE: rsgps 1.37 RS94.prl 1.99.2 START: 2015/07/15 01:13:30
EPHEMERIS: igr18533.eph [rapid] STOP: 2015/07/15 01:44:26
NAV FILE: brdc1960.15n OBS USED: 1392 / 1650 : 84%
ANT NAME: TPSHIPER_V NONE QUALITY IND. 12.76/ 28.27
ARP HEIGHT: 2.0 NORMALIZED RMS: 0.303

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53442)

X: -1932830.482(m) 0.008(m) -1932831.382(m) 0.008(m)
Y: -3728817.988(m) 0.035(m) -3728816.800(m) 0.035(m)
Z: 4785525.740(m) 0.028(m) 4785525.759(m) 0.028(m)

LAT: 48 55 8.58216 0.009(m) 48 55 8.59819 0.009(m)
E LON: 242 36 0.22575 0.010(m) 242 36 0.15966 0.010(m)
W LON: 117 23 59.77425 0.010(m) 117 23 59.84034 0.010(m)
EL HGT: 1164.566(m) 0.044(m) 1164.160(m) 0.044(m)
ORTHO HGT: 1180.855(m) 0.047(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5418534.166 218989.323
Easting (X) [meters] 470700.233 751561.278
Convergence [degrees] -0.30146763 2.55623314
Point Scale 0.99961055 1.00004024
Combined Factor 0.99942815 0.99985776

US NATIONAL GRID DESIGNATOR: 11UMQ7070018534(NAD 83)



FILE: GCP72.O00 OP1437418429527

6011 Warning - OPUS-RS was able to find a set of reference stations
6011 with data suitable for use with your dataset. However, your
6011 position does not fall within the polygon enclosing these reference
6011 stations. This means that the geographic interpolation algorithms
6011 performed within OPUS-RS must instead perform extrapolation.
6011 Extrapolation, especially if your position is far from the
6011 reference stations, is prone to error. Use this solution with
6011 caution.

p025
rkd1
drao
brew
mtfv

Your station is 5.9 KM outside the polygon enclosing the reference stations

NGS OPUS-RS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com DATE: July 20, 2015
RINEX FILE: 0000193r.15o TIME: 18:58:17 UTC

SOFTWARE: rsgps 1.37 RS52.prl 1.99.2 START: 2015/07/12 17:15:09
EPHEMERIS: igr18530.eph [rapid] STOP: 2015/07/12 18:15:25
NAV FILE: brdc1930.15n OBS USED: 3590 / 4190 : 86%
ANT NAME: LEIAT502 NONE QUALITY IND. 21.17/ 49.17
ARP HEIGHT: 1.501 NORMALIZED RMS: 0.325

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52805)

X: -1928158.176(m) 0.005(m) -1928159.076(m) 0.005(m)
Y: -3725737.228(m) 0.008(m) -3725736.040(m) 0.008(m)
Z: 4789207.971(m) 0.006(m) 4789207.991(m) 0.006(m)

LAT: 48 58 26.07439 0.004(m) 48 58 26.09047 0.004(m)
E LON: 242 38 14.47325 0.003(m) 242 38 14.40711 0.003(m)
W LON: 117 21 45.52675 0.003(m) 117 21 45.59289 0.003(m)
EL HGT: 733.395(m) 0.010(m) 732.989(m) 0.010(m)



ORTHO HGT: 749.749(m) 0.020(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 11)	SPC (4601 WA N)	
Northing (Y) [meters]	5424618.797	225206.761
Easting (X) [meters]	473461.305	754016.644
Convergence [degrees]	-0.27358587	2.58399703
Point Scale	0.99960865	1.00005416
Combined Factor	0.99949378	0.99993923

US NATIONAL GRID DESIGNATOR: 11UMQ7346124618(NAD 83)



FILE: GCP73.O00 OP1438567022105

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com DATE: August 03, 2015
RINEX FILE: gcp7193a.15o TIME: 02:00:03 UTC

SOFTWARE: rsgps 1.37 RS94.prl 1.99.2 START: 2015/07/12 00:30:16
EPHEMERIS: igs18530.eph [precise] STOP: 2015/07/12 01:02:06
NAV FILE: brdc1930.15n OBS USED: 1325 / 1475 : 90%
ANT NAME: LEIAT502 NONE QUALITY IND. 41.30/ 30.52
ARP HEIGHT: 1.585 NORMALIZED RMS: 0.345

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52612)

X: -1944204.440(m) 0.007(m) -1944205.339(m) 0.007(m)
Y: -3737262.427(m) 0.019(m) -3737261.238(m) 0.019(m)
Z: 4774105.434(m) 0.020(m) 4774105.452(m) 0.020(m)

LAT: 48 45 54.94761 0.005(m) 48 45 54.96357 0.005(m)
E LON: 242 30 56.07863 0.008(m) 242 30 56.01271 0.008(m)
W LON: 117 29 3.92137 0.008(m) 117 29 3.98729 0.008(m)
EL HGT: 948.221(m) 0.027(m) 947.812(m) 0.027(m)
ORTHO HGT: 964.973(m) 0.032(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5401474.911 201630.169
Easting (X) [meters] 464401.956 746119.102
Convergence [degrees] -0.36429707 2.49333211
Point Scale 0.99961557 1.00000616
Combined Factor 0.99946705 0.99985758

US NATIONAL GRID DESIGNATOR: 11UMQ6440101474(NAD 83)



FILE: GCP74.O00 OP1437417661062

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: gcp7195a.15o

DATE: July 20, 2015
TIME: 18:47:27 UTC

SOFTWARE: rsgps 1.37 RS91.prl 1.99.2 START: 2015/07/14 00:34:31
EPHEMERIS: igr18532.eph [rapid] STOP: 2015/07/14 01:18:30
NAV FILE: brdc1950.15n OBS USED: 3367 / 3612 : 93%
ANT NAME: LEIAT502 NONE QUALITY IND. 12.02/ 36.70
ARP HEIGHT: 1.499 NORMALIZED RMS: 0.316

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53161)

X: -1948579.416(m) 0.007(m) -1948580.316(m) 0.007(m)
Y: -3733036.128(m) 0.017(m) -3733034.939(m) 0.017(m)
Z: 4775621.670(m) 0.018(m) 4775621.689(m) 0.018(m)

LAT: 48 47 9.31354 0.005(m) 48 47 9.32947 0.005(m)
E LON: 242 26 10.42952 0.004(m) 242 26 10.36349 0.004(m)
W LON: 117 33 49.57048 0.004(m) 117 33 49.63651 0.004(m)
EL HGT: 951.063(m) 0.025(m) 950.657(m) 0.025(m)
ORTHO HGT: 967.810(m) 0.030(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5403811.281 203674.548
Easting (X) [meters] 458588.121 740193.693
Convergence [degrees] -0.42410336 2.43425667
Point Scale 0.99962107 1.00001031
Combined Factor 0.99947210 0.99986128

US NATIONAL GRID DESIGNATOR: 11UMQ5858803811(NAD 83)



FILE: GCP75.O00 OP1437028796744

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: gcp7195s.15o

DATE: July 16, 2015
TIME: 06:43:10 UTC

SOFTWARE: rsgps 1.37 RS51.prl 1.99.2 START: 2015/07/14 18:55:17
EPHEMERIS: igr18532.eph [rapid] STOP: 2015/07/14 19:30:44
NAV FILE: brdc1950.15n OBS USED: 1134 / 2298 : 49%
ANT NAME: LEIAT502 NONE QUALITY IND. 11.66/ 2.69
ARP HEIGHT: 1.539 NORMALIZED RMS: 0.384

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53370)

X: -1941532.085(m) 0.012(m) -1941532.985(m) 0.012(m)
Y: -3724921.837(m) 0.077(m) -3724920.649(m) 0.077(m)
Z: 4784693.209(m) 0.047(m) 4784693.229(m) 0.047(m)

LAT: 48 54 37.30511 0.018(m) 48 54 37.32109 0.018(m)
E LON: 242 28 12.82992 0.044(m) 242 28 12.76376 0.044(m)
W LON: 117 31 47.17008 0.044(m) 117 31 47.23624 0.044(m)
EL HGT: 902.577(m) 0.078(m) 902.173(m) 0.078(m)
ORTHO HGT: 919.036(m) 0.080(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5417626.545 217607.607
Easting (X) [meters] 461181.911 742096.036
Convergence [degrees] -0.39928281 2.45957045
Point Scale 0.99961851 1.00003812
Combined Factor 0.99947714 0.99989669

US NATIONAL GRID DESIGNATOR: 11UMQ6118117626(NAD 83)



FILE: GCP76.O00 OP1437553258115

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: gcp7201c.15o

DATE: July 22, 2015
TIME: 08:24:26 UTC

SOFTWARE: rsgps 1.37 RS92.prl 1.99.2 START: 2015/07/20 02:22:55
EPHEMERIS: igr18541.eph [rapid] STOP: 2015/07/20 02:53:22
NAV FILE: brdc2010.15n OBS USED: 1470 / 2415 : 61%
ANT NAME: LEIAT502 NONE QUALITY IND. 27.33/ 31.07
ARP HEIGHT: 1.475 NORMALIZED RMS: 0.304

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.54825)

X: -1941843.811(m) 0.012(m) -1941844.711(m) 0.012(m)
Y: -3733244.859(m) 0.023(m) -3733243.670(m) 0.023(m)
Z: 4778594.052(m) 0.023(m) 4778594.071(m) 0.023(m)

LAT: 48 49 23.97425 0.006(m) 48 49 23.99024 0.006(m)
E LON: 242 31 7.84563 0.005(m) 242 31 7.77960 0.005(m)
W LON: 117 28 52.15437 0.005(m) 117 28 52.22040 0.005(m)
EL HGT: 1259.622(m) 0.034(m) 1259.215(m) 0.034(m)
ORTHO HGT: 1276.136(m) 0.038(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5407927.711 208091.515
Easting (X) [meters] 464682.931 746077.993
Convergence [degrees] -0.36216016 2.49576566
Point Scale 0.99961532 1.00001817
Combined Factor 0.99941803 0.99982080

US NATIONAL GRID DESIGNATOR: 11UMQ6468207927(NAD 83)



FILE: GCP77.O00 OP1437418675254

6011 Warning - OPUS-RS was able to find a set of reference stations
6011 with data suitable for use with your dataset. However, your
6011 position does not fall within the polygon enclosing these reference
6011 stations. This means that the geographic interpolation algorithms
6011 performed within OPUS-RS must instead perform extrapolation.
6011 Extrapolation, especially if your position is far from the
6011 reference stations, is prone to error. Use this solution with
6011 caution.

p025
drao
spn6
brew
p422

Your station is 3.8 KM outside the polygon enclosing the reference stations

NGS OPUS-RS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com DATE: July 20, 2015
RINEX FILE: gcp7195w.15o TIME: 19:01:03 UTC

SOFTWARE: rsgps 1.37 RS50.prl 1.99.2 START: 2015/07/14 22:59:39
EPHEMERIS: igr18532.eph [rapid] STOP: 2015/07/14 23:45:45
NAV FILE: brdc1950.15n OBS USED: 1295 / 1885 : 69%
ANT NAME: LEIAT502 NONE QUALITY IND. 24.33/ 2.53
ARP HEIGHT: 1.611 NORMALIZED RMS: 0.539

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.53418)

X: -1935961.179(m) 0.017(m) -1935962.080(m) 0.017(m)
Y: -3721185.537(m) 0.029(m) -3721184.350(m) 0.029(m)
Z: 4790285.502(m) 0.034(m) 4790285.522(m) 0.034(m)

LAT: 48 58 59.86308 0.042(m) 48 58 59.87907 0.042(m)
E LON: 242 30 50.83146 0.009(m) 242 30 50.76522 0.009(m)
W LON: 117 29 9.16854 0.009(m) 117 29 9.23478 0.009(m)
EL HGT: 1253.428(m) 0.022(m) 1253.025(m) 0.022(m)



ORTHO HGT: 1269.833(m) 0.028(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 11)	SPC (4601 WA N)	
Northing (Y) [meters]	5425712.537	225850.064
Easting (X) [meters]	464449.674	744957.668
Convergence [degrees]	-0.36660927	2.49224694
Point Scale	0.99961553	1.00005663
Combined Factor	0.99941921	0.99986023

US NATIONAL GRID DESIGNATOR: 11UMQ6444925712(NAD 83)



FILE: GCP78.O00 OP1436824403638

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 13, 2015
RINEX FILE: 0000192s.15o TIME: 22:31:02 UTC

SOFTWARE: rsgps 1.37 RS92.prl 1.99.2 START: 2015/07/11 18:52:54
EPHEMERIS: igr18526.eph [rapid] STOP: 2015/07/11 19:30:30
NAV FILE: brdc1920.15n OBS USED: 2015 / 2105 : 96%
ANT NAME: LEIAT502 NONE QUALITY IND. 22.34/ 28.63
ARP HEIGHT: 1.492 NORMALIZED RMS: 0.271

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52548)

X: -1938064.525(m) 0.009(m) -1938065.425(m) 0.009(m)
Y: -3736730.167(m) 0.015(m) -3736728.978(m) 0.015(m)
Z: 4776552.727(m) 0.016(m) 4776552.745(m) 0.016(m)

LAT: 48 48 7.55590 0.003(m) 48 48 7.57190 0.003(m)
E LON: 242 35 10.94616 0.005(m) 242 35 10.88018 0.005(m)
W LON: 117 24 49.05384 0.005(m) 117 24 49.11982 0.005(m)
EL HGT: 613.052(m) 0.023(m) 612.643(m) 0.023(m)
ORTHO HGT: 629.736(m) 0.029(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5405538.924 205951.303
Easting (X) [meters] 469626.700 751136.741
Convergence [degrees] -0.31123077 2.54604157
Point Scale 0.99961133 1.00001366
Combined Factor 0.99951530 0.99991759

US NATIONAL GRID DESIGNATOR: 11UMQ6962605538(NAD 83)



FILE: GCP79.O00 OP1437418532360

6011 Warning - OPUS-RS was able to find a set of reference stations
6011 with data suitable for use with your dataset. However, your
6011 position does not fall within the polygon enclosing these reference
6011 stations. This means that the geographic interpolation algorithms
6011 performed within OPUS-RS must instead perform extrapolation.
6011 Extrapolation, especially if your position is far from the
6011 reference stations, is prone to error. Use this solution with
6011 caution.

p025
rkd1
spn6
drao
brew
mtfv

Your station is 1.0 KM outside the polygon enclosing the reference stations

NGS OPUS-RS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: rhuey@theatlgrp.com
RINEX FILE: gcp7192w.15o

DATE: July 20, 2015
TIME: 18:59:07 UTC

SOFTWARE: rsgps 1.37 RS50.prl 1.99.2 START: 2015/07/11 22:48:34
EPHEMERIS: igr18526.eph [rapid] STOP: 2015/07/11 23:24:29
NAV FILE: brdc1920.15n OBS USED: 2028 / 2160 : 94%
ANT NAME: LEIAT502 NONE QUALITY IND. 17.30/ 48.54
ARP HEIGHT: 1.450 NORMALIZED RMS: 0.235

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52593)

X: -1929209.426(m) 0.006(m) -1929210.326(m) 0.006(m)
Y: -3729482.718(m) 0.015(m) -3729481.530(m) 0.015(m)
Z: 4785967.913(m) 0.023(m) 4785967.932(m) 0.023(m)

LAT: 48 55 44.20946 0.007(m) 48 55 44.22553 0.007(m)
E LON: 242 38 53.17628 0.004(m) 242 38 53.11020 0.004(m)
W LON: 117 21 6.82372 0.004(m) 117 21 6.88980 0.004(m)



EL HGT: 791.704(m) 0.027(m) 791.297(m) 0.027(m)
ORTHO HGT: 808.055(m) 0.032(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 11)	SPC (4601 WA N)	
Northing (Y) [meters]	5419616.886	220246.953
Easting (X) [meters]	474224.906	755029.092
Convergence [degrees]	-0.26529384	2.59200125
Point Scale	0.99960816	1.00004268
Combined Factor	0.99948415	0.99991862

US NATIONAL GRID DESIGNATOR: 11UMQ7422419616(NAD 83)



FILE: GCP80.O00 OP1436826852144

NGS OPUS-RS SOLUTION REPORT

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All computed coordinate accuracies are listed as 1-sigma RMS values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: srjones@theatlgrp.com DATE: July 13, 2015
RINEX FILE: 0000192u.15o TIME: 22:40:44 UTC

SOFTWARE: rsgps 1.37 RS91.prl 1.99.2 START: 2015/07/11 20:13:07
EPHEMERIS: igr18526.eph [rapid] STOP: 2015/07/11 20:43:11
NAV FILE: brdc1920.15n OBS USED: 1080 / 1164 : 93%
ANT NAME: LEIAT502 NONE QUALITY IND. 10.14/ 9.87
ARP HEIGHT: 1.430 NORMALIZED RMS: 0.230

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.52562)

X: -1935105.838(m) 0.011(m) -1935106.738(m) 0.011(m)
Y: -3732717.914(m) 0.016(m) -3732716.725(m) 0.016(m)
Z: 4781035.846(m) 0.024(m) 4781035.865(m) 0.024(m)

LAT: 48 51 43.05677 0.005(m) 48 51 43.07281 0.005(m)
E LON: 242 35 49.17022 0.005(m) 242 35 49.10417 0.005(m)
W LON: 117 24 10.82978 0.005(m) 117 24 10.89583 0.005(m)
EL HGT: 746.658(m) 0.030(m) 746.250(m) 0.030(m)
ORTHO HGT: 763.146(m) 0.035(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5412189.029 212636.498
Easting (X) [meters] 470441.616 751619.336
Convergence [degrees] -0.30351851 2.55394673
Point Scale 0.99961073 1.00002674
Combined Factor 0.99949378 0.99990974

US NATIONAL GRID DESIGNATOR: 11UMQ7044112189(NAD 83)



FILE: G483.O00 OP1437690759027

NGS OPUS SOLUTION REPORT

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All computed coordinate accuracies are listed as peak-to-peak values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: jmartin@theatlgrp.com
RINEX FILE: g483200l.15o

DATE: July 23, 2015
TIME: 22:40:44 UTC

SOFTWARE: page5 1209.04 master93.pl 022814 START: 2015/07/19 11:37:00
EPHEMERIS: igr18540.eph [rapid] STOP: 2015/07/19 23:42:00
NAV FILE: brdc2000.15n OBS USED: 27030 / 28486 : 95%
ANT NAME: LEIAT502 NONE # FIXED AMB: 118 / 125 : 94%
ARP HEIGHT: 1.781 OVERALL RMS: 0.015(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.5472)

X:	-1931399.997(m)	0.004(m)	-1931400.897(m)	0.004(m)
Y:	-3733596.077(m)	0.014(m)	-3733594.888(m)	0.014(m)
Z:	4781849.163(m)	0.005(m)	4781849.182(m)	0.005(m)

LAT:	48 52 22.90898	0.008(m)	48 52 22.92505	0.008(m)
E LON:	242 38 50.43980	0.003(m)	242 38 50.37377	0.003(m)
W LON:	117 21 9.56020	0.003(m)	117 21 9.62623	0.003(m)
EL HGT:	751.199(m)	0.013(m)	750.791(m)	0.013(m)
ORTHO HGT:	767.677(m)	0.028(m)	[NAVD88 (Computed using GEOID12B)]	

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 11)	SPC (4601 WA N)		
Northing (Y) [meters]	5413401.262	214032.185	
Easting (X) [meters]	474140.398	755254.613	
Convergence [degrees]	-0.26564067	2.59143531	
Point Scale	0.99960822	1.00002928	
Combined Factor	0.99949056	0.99991157	

US NATIONAL GRID DESIGNATOR: 11UMQ7414013401(NAD 83)



FILE: K24.O01 OP1437661906847

NGS OPUS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as peak-to-peak values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: jmartin@theatlgrp.com DATE: July 23, 2015
RINEX FILE: k24_189o.15o TIME: 14:34:43 UTC

SOFTWARE: page5 1209.04 master90.pl 022814 START: 2015/07/08 14:47:00
EPHEMERIS: igr18523.eph [rapid] STOP: 2015/07/09 04:42:00
NAV FILE: brdc1890.15n OBS USED: 26761 / 27326 : 98%
ANT NAME: LEIAT502 NONE # FIXED AMB: 132 / 139 : 95%
ARP HEIGHT: 1.365 OVERALL RMS: 0.015(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.5175)

X: -1981775.795(m) 0.011(m) -1981776.692(m) 0.011(m)
Y: -3769672.924(m) 0.008(m) -3769671.731(m) 0.008(m)
Z: 4732658.303(m) 0.016(m) 4732658.316(m) 0.016(m)

LAT: 48 12 27.50310 0.006(m) 48 12 27.51879 0.006(m)
E LON: 242 16 6.22448 0.006(m) 242 16 6.15914 0.006(m)
W LON: 117 43 53.77552 0.006(m) 117 43 53.84086 0.006(m)
EL HGT: 488.546(m) 0.018(m) 488.130(m) 0.018(m)
ORTHO HGT: 506.455(m) 0.034(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5339637.676 138913.605
Easting (X) [meters] 445645.125 730461.834
Convergence [degrees] -0.54547176 2.30930030
Point Scale 0.99963630 0.99994348
Combined Factor 0.99955976 0.99986692

US NATIONAL GRID DESIGNATOR: 11UMP4564539637(NAD 83)



FILE: SET1.O00 OP1437668808142

NGS OPUS SOLUTION REPORT

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All computed coordinate accuracies are listed as peak-to-peak values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: jmartin@theatlgrp.com
RINEX FILE: set1199r.15o

DATE: July 23, 2015
TIME: 16:29:24 UTC

SOFTWARE: page5 1209.04 master50.pl 022814 START: 2015/07/18 17:11:00
EPHEMERIS: igr18536.eph [rapid] STOP: 2015/07/19 04:03:00
NAV FILE: brdc1990.15n OBS USED: 11110 / 14590 : 76%
ANT NAME: LEIAT502 NONE # FIXED AMB: 114 / 124 : 92%
ARP HEIGHT: 1.545 OVERALL RMS: 0.017(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.5450)

X:	-2002422.815(m)	0.010(m)	-2002423.715(m)	0.010(m)
Y:	-3723920.685(m)	0.026(m)	-3723919.497(m)	0.026(m)
Z:	4760191.157(m)	0.022(m)	4760191.176(m)	0.022(m)

LAT:	48 34 42.52584	0.006(m)	48 34 42.54130	0.006(m)
E LON:	241 43 56.05377	0.008(m)	241 43 55.98765	0.008(m)
W LON:	118 16 3.94623	0.008(m)	118 16 4.01235	0.008(m)
EL HGT:	687.248(m)	0.034(m)	686.852(m)	0.034(m)
ORTHO HGT:	704.422(m)	0.061(m)	[NAVD88 (Computed using GEOID12B)]	

UTM COORDINATES		STATE PLANE COORDINATES	
UTM (Zone 11)	SPC (4601 WA N)		
Northing (Y) [meters]	5381374.844	178658.551	
Easting (X) [meters]	406493.606	689266.551	
Convergence [degrees]	-0.95071648	1.91011938	
Point Scale	0.99970742	0.99997456	
Combined Factor	0.99959976	0.99986687	

US NATIONAL GRID DESIGNATOR: 11UMP0649381374(NAD 83)



FILE: Set2.000 OP1437662066246

NGS OPUS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as peak-to-peak values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: jmartin@theatlgrp.com
RINEX FILE: set2189n.15o

DATE: July 23, 2015
TIME: 14:37:23 UTC

SOFTWARE: page5 1209.04 master90.pl 022814 START: 2015/07/08 13:23:00
EPHEMERIS: igr18523.eph [rapid] STOP: 2015/07/09 05:18:00
NAV FILE: brdc1890.15n OBS USED: 19424 / 21165 : 92%
ANT NAME: LEIAT502 NONE # FIXED AMB: 142 / 151 : 94%
ARP HEIGHT: 1.579 OVERALL RMS: 0.016(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.5175)

X:	-1950478.943(m)	0.007(m)	-1950479.842(m)	0.007(m)
Y:	-3745054.608(m)	0.009(m)	-3745053.418(m)	0.009(m)
Z:	4765513.642(m)	0.008(m)	4765513.659(m)	0.008(m)

LAT:	48 38 52.87820	0.010(m)	48 38 52.89411	0.010(m)
E LON:	242 29 19.83765	0.010(m)	242 29 19.77185	0.010(m)
W LON:	117 30 40.16235	0.010(m)	117 30 40.22815	0.010(m)
EL HGT:	965.905(m)	0.002(m)	965.495(m)	0.002(m)
ORTHO HGT:	982.757(m)	0.017(m)	[NAVD88 (Computed using GEOID12B)]	

UTM COORDINATES		STATE PLANE COORDINATES	
UTM (Zone 11)	SPC (4601 WA N)		
Northing (Y) [meters]	5388455.298	188519.490	
Easting (X) [meters]	462350.072	744718.268	
Convergence [degrees]	-0.38371160	2.47342840	
Point Scale	0.99961741	0.99998507	
Combined Factor	0.99946611	0.99983372	

US NATIONAL GRID DESIGNATOR: 11UMP6235088455(NAD 83)



FILE: SET3.tps OP1437668503895

NGS OPUS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as peak-to-peak values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: jmartin@theatlgrp.com
RINEX FILE: set3198x.15o

DATE: July 23, 2015
TIME: 16:25:33 UTC

SOFTWARE: page5 1209.04 master92.pl 022814 START: 2015/07/17 23:40:00
EPHEMERIS: igr18535.eph [rapid] STOP: 2015/07/18 05:43:00
NAV FILE: brdc1980.15n OBS USED: 13408 / 13736 : 98%
ANT NAME: TPSHIPPER_V NONE # FIXED AMB: 55 / 55 : 100%
ARP HEIGHT: 2.000 OVERALL RMS: 0.009(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.5428)

X:	-1981765.810(m)	0.002(m)	-1981766.707(m)	0.002(m)
Y:	-3769672.228(m)	0.002(m)	-3769671.035(m)	0.002(m)
Z:	4732662.814(m)	0.006(m)	4732662.827(m)	0.006(m)

LAT:	48 12 27.72743	0.005(m)	48 12 27.74313	0.005(m)
E LON:	242 16 6.63684	0.002(m)	242 16 6.57150	0.002(m)
W LON:	117 43 53.36316	0.002(m)	117 43 53.42850	0.002(m)
EL HGT:	488.402(m)	0.004(m)	487.986(m)	0.004(m)
ORTHO HGT:	506.311(m)	0.018(m)	[NAVD88 (Computed using GEOID12B)]	

UTM COORDINATES		STATE PLANE COORDINATES	
UTM (Zone 11)	SPC (4601 WA N)		
Northing (Y) [meters]	5339644.521	138920.872	
Easting (X) [meters]	445653.701	730470.061	
Convergence [degrees]	-0.54538688	2.30938558	
Point Scale	0.99963629	0.99994348	
Combined Factor	0.99955978	0.99986694	

US NATIONAL GRID DESIGNATOR: 11UMP4565339644(NAD 83)



FILE: Z264.O00 OP1437668991399

NGS OPUS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as peak-to-peak values.
For additional information: <http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: jmartin@theatlgrp.com DATE: July 23, 2015
RINEX FILE: z264199q.15o TIME: 16:32:37 UTC

SOFTWARE: page5 1209.04 master91.pl 022814 START: 2015/07/18 16:06:00
EPHEMERIS: igr18536.eph [rapid] STOP: 2015/07/19 01:41:00
NAV FILE: brdc1990.15n OBS USED: 22063 / 22767 : 97%
ANT NAME: LEIAT502 NONE # FIXED AMB: 101 / 108 : 94%
ARP HEIGHT: 1.551 OVERALL RMS: 0.014(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2015.5448)

X: -1979066.235(m) 0.012(m) -1979067.134(m) 0.012(m)
Y: -3739774.239(m) 0.010(m) -3739773.050(m) 0.010(m)
Z: 4757366.145(m) 0.004(m) 4757366.162(m) 0.004(m)

LAT: 48 32 29.33429 0.008(m) 48 32 29.34995 0.008(m)
E LON: 242 6 44.90511 0.006(m) 242 6 44.83927 0.006(m)
W LON: 117 53 15.09489 0.006(m) 117 53 15.16073 0.006(m)
EL HGT: 551.406(m) 0.013(m) 551.001(m) 0.013(m)
ORTHO HGT: 568.970(m) 0.028(m) [NAVD88 (Computed using GEOID12B)]

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 11) SPC (4601 WA N)
Northing (Y) [meters] 5376866.782 175551.915
Easting (X) [meters] 434490.617 717461.876
Convergence [degrees] -0.66516707 2.19321317
Point Scale 0.99965272 0.99996957
Combined Factor 0.99956634 0.99988316

US NATIONAL GRID DESIGNATOR: 11UMP3449076866(NAD 83)



Appendix B: National Geodetic Survey Monument Data Sheets



The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

PROGRAM = datasheet95, VERSION = 8.7

1 National Geodetic Survey, Retrieval Date = JULY 1, 2015

TO0750 *****

TO0750 DESIGNATION - G 483

TO0750 PID - TO0750

TO0750 STATE/COUNTY- WA/PEND OREILLE

TO0750 COUNTRY - US

TO0750 USGS QUAD - METALINE FALLS (1992)

TO0750

TO0750 *CURRENT SURVEY CONTROL

TO0750

TO0750* NAD 83(2011) POSITION- 48 52 22.90921(N) 117 21 09.55980(W) ADJUSTED

TO0750* NAD 83(2011) ELLIP HT- 751.156 (meters) (06/27/12) ADJUSTED

TO0750* NAD 83(2011) EPOCH - 2010.00

TO0750* NAVD 88 ORTHO HEIGHT - 767.649 (meters) 2518.53 (feet) ADJUSTED

TO0750

TO0750 NAD 83(2011) X - -1,931,399.974 (meters)

COMP

TO0750 NAD 83(2011) Y - -3,733,596.051 (meters)

COMP

TO0750 NAD 83(2011) Z - 4,781,849.135 (meters)

COMP

TO0750 LAPLACE CORR - 2.90 (seconds)

DEFLEC12B

TO0750 GEOID HEIGHT - -16.48 (meters)

GEOID12B

TO0750 DYNAMIC HEIGHT - 767.745 (meters)

2518.84 (feet) COMP

TO0750 MODELED GRAVITY - 980,709.8 (mgal)

NAVD 88

TO0750

TO0750 VERT ORDER - SECOND CLASS I

TO0750

TO0750 Network accuracy estimates per FGDC Geospatial Positioning Accuracy

TO0750 Standards:

TO0750 FGDC (95% conf, cm) Standard deviation (cm) CorrNE

TO0750 Horiz Ellip SD_N SD_E SD_h (unitless)

TO0750 -----

TO0750 NETWORK 0.49 1.33 0.23 0.16 0.68 0.08786171

TO0750 -----

TO0750 [Click here for local accuracies and other accuracy information.](#)

TO0750

TO0750

TO0750.The horizontal coordinates were established by GPS observations

TO0750.and adjusted by the National Geodetic Survey in June 2012.

TO0750



TO0750.NAD 83(2011) refers to NAD 83 coordinates where the reference TO0750.frame has been affixed to the stable North American tectonic plate. See TO0750.NA2011 for more information.

TO0750

TO0750.The horizontal coordinates are valid at the epoch date displayed above TO0750.which is a decimal equivalence of Year/Month/Day.

TO0750

TO0750.The orthometric height was determined by differential leveling and TO0750.adjusted by the NATIONAL GEODETIC SURVEY

TO0750.in April 2009.

TO0750

TO0750.The X, Y, and Z were computed from the position and the ellipsoidal ht.

TO0750

TO0750.The Laplace correction was computed from DEFLEC12B derived deflections.

TO0750

TO0750.The ellipsoidal height was determined by GPS observations

TO0750.and is referenced to NAD 83.

TO0750

TO0750.The dynamic height is computed by dividing the NAVD 88

TO0750.geopotential number by the normal gravity value computed on the

TO0750.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45

TO0750.degrees latitude ($g = 980.6199$ gals.).

TO0750

TO0750.The modeled gravity was interpolated from observed gravity values.

TO0750

TO0750. The following values were computed from the NAD 83(2011) position.

TO0750

TO0750; North East Units Scale Factor Converg.

TO0750;SPC WA N - 214,032.193 755,254.621 MT 1.00002928 +2 35 29.2

TO0750;SPC WA N - 702,203.95 2,477,864.54 sFT 1.00002928 +2 35 29.2

TO0750;UTM 11 - 5,413,401.269 474,140.406 MT 0.99960822 -0 15 56.3

TO0750

TO0750! - Elev Factor x Scale Factor = Combined Factor

TO0750!SPC WA N - $0.99988230 \times 1.00002928 = 0.99991157$

TO0750!UTM 11 - $0.99988230 \times 0.99960822 = 0.99949056$

TO0750

TO0750 SUPERSEDED SURVEY CONTROL

TO0750

TO0750 NAD 83(2007)- 48 52 22.90879(N) 117 21 09.56121(W) AD(2007.00) A

TO0750 ELLIP H (10/23/09) 751.170 (m) GP(2007.00) 3 1

TO0750 NAVD 88 (10/23/09) 767.65 (m) 2518.5 (f) LEVELING 3

TO0750 NAVD 88 (06/15/91) 767.645 (m) 2518.52 (f) SUPERSEDED 1 2

TO0750

TO0750.Superseded values are not recommended for survey control.

TO0750

TO0750.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

TO0750.See file dsdata.txt to determine how the superseded data were derived.

TO0750



TO0750_U.S. NATIONAL GRID SPATIAL ADDRESS: 11UMQ7414013401(NAD 83)

TO0750

TO0750_MARKER: F = FLANGE-ENCASED ROD

TO0750_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)

TO0750_SP_SET: STAINLESS STEEL ROD

TO0750_STAMPING: G 483 1980

TO0750_MARK LOGO: NGS

TO0750_PROJECTION: RECESSED 10 CENTIMETERS

TO0750_MAGNETIC: N = NO MAGNETIC MATERIAL

TO0750_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL

TO0750_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

TO0750+SATELLITE: SATELLITE OBSERVATIONS - August 18, 2009

TO0750_ROD/PIPE-DEPTH: 9.1 meters

TO0750

TO0750 HISTORY - Date Condition Report By

TO0750 HISTORY - 1980 MONUMENTED NGS

TO0750 HISTORY - 20060719 GOOD WADNR

TO0750 HISTORY - 20070508 GOOD WADT

TO0750 HISTORY - 20090818 GOOD WHPACI

TO0750

TO0750 STATION DESCRIPTION

TO0750

TO0750'DESCRIBED BY NATIONAL GEODETIC SURVEY 1980

TO0750'3.3 KM (2.05 MI) NE FROM METALINE FALLS.

TO0750'3.3 KILOMETERS (2.05 MILES) NORTHEAST ALONG STATE HIGHWAY 31 FROM THE

TO0750'SOUTHEAST END OF THE HIGHWAY BRIDGE OVER THE PEND OREILLE RIVER IN

TO0750'METALINE FALLS, AT THE JUNCTION OF SULLIVAN LAKE ROAD, 12.8 METERS

TO0750'(42.0 FEET) EAST OF THE CENTERLINE OF THE HIGHWAY, 38.1 METERS (125

TO0750'FEET) NORTH OF THE CENTERLINE OF THE ROAD, 0.75 METERS (2.5 FEET)

TO0750'WEST OF A BARBED WIRE FENCE CORNER POST.

TO0750'THE MARK IS 0.6 METERS S FROM A WITNESS POST.

TO0750'THE MARK IS ABOVE LEVEL WITH THE HIGHWAY.

TO0750

TO0750 STATION RECOVERY (2006)

TO0750

TO0750'RECOVERY NOTE BY WA DEPT OF NAT RES 2006 (DLS)

TO0750'LAT 48 52 22.8 N

TO0750'LONG 117 21 09.7 W

TO0750'WADOT WITNESS POST 2 FT SW

TO0750

TO0750 STATION RECOVERY (2007)

TO0750

TO0750'RECOVERY NOTE BY WA DEPT OF TRANSP 2007 (KW)

TO0750'RECOVERED AS DESCRIBED.

TO0750

TO0750 STATION RECOVERY (2009)



TO0750

TO0750'RECOVERY NOTE BY W + H PACIFIC, INCORPORATED 2009 (WHP)

TO0750'THE STATION IS LOCATED IN PEND OREILLE COUNTY, 2 MI (3.2 KM) NORTH OF
TO0750'METALINE FALLS, 10 MI (16.1 KM) SOUTH OF USA/CANADA BORDER

CROSSING,

TO0750'16 MI (25.7 KM) NORTH OF TIGER.

TO0750'

TO0750'TO REACH THE STATION FROM THE SOUTHEAST END OF THE BRIDGE OVER
PEND

TO0750'OREILLE RIVER IN METALINE FALLS, TRAVEL 2.05 MI (3.3 KM) NORTH ALONG
TO0750'HIGHWAY 31 TO THE INTERSECTION WITH SULLIVAN LAKE ROAD.

TO0750'

TO0750'THE STATION IS A STAINLESS STEEL ROD WITHOUT A SLEEVE, SET 10 CM (4
TO0750'INCHES) BELOW RIM OF CASE, 12.8 M (42.0 FT) EAST OF THE CENTERLINE
TO0750'HIGHWAY 31, 38.1 M (125.0 FT) NORTH OF THE CENTERLINE SULLIVAN LAKE
TO0750'ROAD, AND 0.75 M (2.5 FT) WEST OF BARBED WIRE FENCE CORNER.

TO0750'

TO0750'RECOVERED IN GOOD CONDITION.

*** retrieval complete.

Elapsed Time = 00:00:03



The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

PROGRAM = datasheet95, VERSION = 8.7

1 National Geodetic Survey, Retrieval Date = JULY 1, 2015

TO0445 *****

TO0445 DESIGNATION - K 24

TO0445 PID - TO0445

TO0445 STATE/COUNTY- WA/STEVENS

TO0445 COUNTRY - US

TO0445 USGS QUAD - VALLEY (1992)

TO0445

TO0445 *CURRENT SURVEY CONTROL

TO0445

TO0445* NAD 83(2011) POSITION- 48 12 27.50351(N) 117 43 53.77544(W) ADJUSTED

TO0445* NAD 83(2011) ELLIP HT- 488.499 (meters) (06/27/12) ADJUSTED

TO0445* NAD 83(2011) EPOCH - 2010.00

TO0445* NAVD 88 ORTHO HEIGHT - 506.404 (meters) 1661.43 (feet) ADJUSTED

TO0445

TO0445 NAD 83(2011) X - -1,981,775.774 (meters)

COMP

TO0445 NAD 83(2011) Y - -3,769,672.889 (meters)

COMP

TO0445 NAD 83(2011) Z - 4,732,658.276 (meters)

COMP

TO0445 LAPLACE CORR - 5.72 (seconds)

DEFLEC12B

TO0445 GEOID HEIGHT - -17.91 (meters)

GEOID12B

TO0445 DYNAMIC HEIGHT - 506.462 (meters) 1661.62 (feet) COMP

TO0445 MODELED GRAVITY - 980,710.2 (mgal)

NAVD 88

TO0445

TO0445 VERT ORDER - FIRST CLASS II

TO0445

TO0445 Network accuracy estimates per FGDC Geospatial Positioning Accuracy

TO0445 Standards:

TO0445 FGDC (95% conf, cm) Standard deviation (cm) CorrNE

TO0445 Horiz Ellip SD_N SD_E SD_h (unitless)

TO0445 -----

TO0445 NETWORK 0.33 0.82 0.15 0.12 0.42 0.04540606

TO0445 -----

TO0445 [Click here for local accuracies and other accuracy information.](#)

TO0445

TO0445

TO0445. The horizontal coordinates were established by GPS observations

TO0445. and adjusted by the National Geodetic Survey in June 2012.

TO0445



TO0445.NAD 83(2011) refers to NAD 83 coordinates where the reference TO0445.frame has been affixed to the stable North American tectonic plate. See TO0445.NA2011 for more information.

TO0445

TO0445.The horizontal coordinates are valid at the epoch date displayed above TO0445.which is a decimal equivalence of Year/Month/Day.

TO0445

TO0445.The orthometric height was determined by differential leveling and TO0445.adjusted by the NATIONAL GEODETIC SURVEY

TO0445.in June 1991.

TO0445

TO0445.WARNING-Repeat measurements at this control monument indicate possible TO0445.vertical movement.

TO0445

TO0445.The X, Y, and Z were computed from the position and the ellipsoidal ht.

TO0445

TO0445.The Laplace correction was computed from DEFLEC12B derived deflections.

TO0445

TO0445.The ellipsoidal height was determined by GPS observations

TO0445.and is referenced to NAD 83.

TO0445

TO0445.The dynamic height is computed by dividing the NAVD 88

TO0445.geopotential number by the normal gravity value computed on the

TO0445.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45

TO0445.degrees latitude ($g = 980.6199$ gals.).

TO0445

TO0445.The modeled gravity was interpolated from observed gravity values.

TO0445

TO0445. The following values were computed from the NAD 83(2011) position.

TO0445

TO0445; North East Units Scale Factor Converg.

TO0445;SPC WA N - 138,913.618 730,461.835 MT 0.99994348 +2 18 33.5

TO0445;SPC WA N - 455,752.43 2,396,523.54 sFT 0.99994348 +2 18 33.5

TO0445;UTM 11 - 5,339,637.689 445,645.127 MT 0.99963630 -0 32 43.7

TO0445

TO0445! - Elev Factor x Scale Factor = Combined Factor

TO0445!SPC WA N - 0.99992344 x 0.99994348 = 0.99986693

TO0445!UTM 11 - 0.99992344 x 0.99963630 = 0.99955977

TO0445

TO0445 SUPERSEDED SURVEY CONTROL

TO0445

TO0445 NAD 83(2007)- 48 12 27.50330(N) 117 43 53.77708(W) AD(2007.00) 0

TO0445 ELLIP H (02/10/07) 488.507 (m) GP(2007.00)

TO0445 NAD 83(1998)- 48 12 27.50310(N) 117 43 53.77739(W) AD() A

TO0445 ELLIP H (03/21/00) 488.503 (m) GP() 3 2

TO0445 NAD 83(1991)- 48 12 27.50150(N) 117 43 53.77808(W) AD() B

TO0445 ELLIP H (11/01/99) 488.659 (m) GP() 4 1

TO0445 NAVD 88 (11/01/99) 506.40 (m) 1661.4 (f) LEVELING 3



TO0445 NGVD 29 (??/??/92) 505.198 (m) 1657.47 (f) ADJ UNCH 1 2

TO0445

TO0445.Superseded values are not recommended for survey control.

TO0445

TO0445.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

TO0445.See file dsdata.txt to determine how the superseded data were derived.

TO0445

TO0445_U.S. NATIONAL GRID SPATIAL ADDRESS: 11UMP4564539637(NAD 83)

TO0445

TO0445_MARKER: DB = BENCH MARK DISK

TO0445_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT

TO0445_SP_SET: SET IN TOP OF CONCRETE MONUMENT

TO0445_STAMPING: K 24 1931

TO0445_MARK LOGO: CGS

TO0445_PROJECTION: PROJECTING 13 CENTIMETERS

TO0445_MAGNETIC: N = NO MAGNETIC MATERIAL

TO0445_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO

TO0445+STABILITY: SURFACE MOTION

TO0445_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

TO0445+SATELLITE: SATELLITE OBSERVATIONS - August 20, 2008

TO0445

TO0445 HISTORY - Date Condition Report By

TO0445 HISTORY - 1931 MONUMENTED CGS

TO0445 HISTORY - 1936 GOOD CGS

TO0445 HISTORY - 19981009 GOOD WADT

TO0445 HISTORY - 20080820 GOOD WHPACI

TO0445

TO0445 STATION DESCRIPTION

TO0445

TO0445'DESCRIBED BY COAST AND GEODETIC SURVEY 1936

TO0445'2.9 MI N FROM VALLEY.

TO0445'2.9 MILES NORTH OF VALLEY ALONG THE GT. NORTHERN RY., 0.3 MILES NORTH

TO0445'OF MILE POST 59. 55 FEET NORTH OF SWITCH STAND OF SHORT BRANCHING

TO0445'TRACK, 40 FEET NORTHEAST OF TRACK, 350 FEET SOUTH OF OLD TRACK SCALES

TO0445'ON BRANCH LINE, AT FENCE LINE. A STANDARD DISK SET IN A CONCRETE TO0445'POST.

TO0445

TO0445 STATION RECOVERY (1998)

TO0445

TO0445'RECOVERY NOTE BY WA DEPT OF TRANSP 1998 (KW)

TO0445'THE STATION IS LOCATED 40 MILES (64.4 KM) NORTH OF SPOKANE AND 5.0

TO0445'MILES (8.0 KM) SOUTH OF CHEWELAH. TO REACH THE STATION FROM THE

TO0445'JUNCTION OF SR 395 AND SR 231, GO SOUTHEAST 40 METERS (131.2 FT) TO

TO0445'SIDE ROAD RIGHT (NEWTON LN) , TURN RIGHT AND GO SOUTHWEST 0.70 MILE

TO0445'(1.13 KM) TO A SIDE ROAD LEFT PARALELLING THE BNSF RAILROAD (DOT



TO0445'LOCATION NO. 59306W) , TURN LEFT AND GO SOUTH 0.10 MILE (0.16 KM) TO TO0445'MARK ON LEFT. IT IS LOCATED IN THE GRASSY MEDIAN BETWEEN GRAVEL ROAD

TO0445'AND FARMERS FIELD, NEAR THE FENCE LINE, 61.7 M (202.4 FT)

TO0445'EAST-NORTHEAST FROM POWER POLE NO. 074500, 60.4 M (198.2 FT) SOUTH

TO0445'FROM POWER POLE NO. 074499 WHICH HAS A METAL SLEEVE 1 M (3.3 FT)

TO0445'ABOVE GROUND, 13.6 METERS (44.6 FT) SOUTH-SOUTHEAST FROM THE SOUTHEAST

TO0445'RAIL, 3.8 METERS (12.5 FT) SOUTH-SOUTHEAST FROM THE APPROXIMATE

TO0445'CENTERLINE OF GRAVEL RD, 1.0 METER (3.3 FT) SOUTHWEST FROM A ORANGE

TO0445'WITNESS POST, 0.30 M (0.98 FT) NORTHWEST FROM A METAL WITNESS POST,

TO0445'AND 0.80 M (2.62 FT) NORTHEAST FROM A ORANGE WITNESS POST. THE MARK

TO0445'PROJECTS 10 CM ABOVE THE GROUND SURFACE.

TO0445

TO0445 STATION RECOVERY (2008)

TO0445

TO0445'RECOVERY NOTE BY W + H PACIFIC, INCORPORATED 2008 (WHP)

TO0445'RECOVERED AS DESCRIBED IN GOOD CONDITION.

*** retrieval complete.

Elapsed Time = 00:00:04



The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

PROGRAM = datasheet95, VERSION = 8.7

1 National Geodetic Survey, Retrieval Date = JULY 1, 2015

TO0513 *****

TO0513 FBN - This is a Federal Base Network Control Station.

TO0513 DESIGNATION - Z 264

TO0513 PID - TO0513

TO0513 STATE/COUNTY- WA/STEVENS

TO0513 COUNTRY - US

TO0513 USGS QUAD - COLVILLE (1992)

TO0513

TO0513 *CURRENT SURVEY CONTROL

TO0513

TO0513* NAD 83(2011) POSITION- 48 32 29.33445(N) 117 53 15.09442(W) ADJUSTED

TO0513* NAD 83(2011) ELLIP HT- 551.391 (meters) (06/27/12) ADJUSTED

TO0513* NAD 83(2011) EPOCH - 2010.00

TO0513* NAVD 88 ORTHO HEIGHT - 568.944 (meters) 1866.61 (feet) ADJUSTED

TO0513

TO0513 NAD 83(2011) X - -1,979,066.220 (meters) COMP

TO0513 NAD 83(2011) Y - -3,739,774.232 (meters) COMP

TO0513 NAD 83(2011) Z - 4,757,366.137 (meters) COMP

TO0513 LAPLACE CORR - 6.10 (seconds) DEFLEC12B

TO0513 GEOID HEIGHT - -17.56 (meters) GEOID12B

TO0513 DYNAMIC HEIGHT - 569.018 (meters) 1866.85 (feet) COMP

TO0513 MODELED GRAVITY - 980,723.3 (mgal) NAVD 88

TO0513

TO0513 VERT ORDER - FIRST CLASS II

TO0513

TO0513 Network accuracy estimates per FGDC Geospatial Positioning Accuracy

TO0513 Standards:

TO0513 FGDC (95% conf, cm) Standard deviation (cm) CorrNE

TO0513 Horiz Ellip SD_N SD_E SD_h (unitless)

TO0513 -----

TO0513 NETWORK 0.33 0.78 0.15 0.11 0.40 0.05650232

TO0513 -----

TO0513 [Click here for local accuracies and other accuracy information.](#)

TO0513

TO0513

TO0513.The horizontal coordinates were established by GPS observations

TO0513.and adjusted by the National Geodetic Survey in June 2012.



TO0513

TO0513.NAD 83(2011) refers to NAD 83 coordinates where the reference TO0513.frame has been affixed to the stable North American tectonic plate. See TO0513.NA2011 for more information.

TO0513

TO0513.The horizontal coordinates are valid at the epoch date displayed above TO0513.which is a decimal equivalence of Year/Month/Day.

TO0513

TO0513.The orthometric height was determined by differential leveling and TO0513.adjusted by the NATIONAL GEODETIC SURVEY TO0513.in June 1991.

TO0513

TO0513.The X, Y, and Z were computed from the position and the ellipsoidal ht.

TO0513

TO0513.The Laplace correction was computed from DEFLEC12B derived deflections.

TO0513

TO0513.The ellipsoidal height was determined by GPS observations

TO0513.and is referenced to NAD 83.

TO0513

TO0513.The dynamic height is computed by dividing the NAVD 88

TO0513.geopotential number by the normal gravity value computed on the

TO0513.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45

TO0513.degrees latitude ($g = 980.6199$ gals.).

TO0513

TO0513.The modeled gravity was interpolated from observed gravity values.

TO0513

TO0513. The following values were computed from the NAD 83(2011) position.

TO0513

TO0513; North East Units Scale Factor Converg.

TO0513;SPC WA N - 175,551.920 717,461.886 MT 0.99996957 +2 11 35.6

TO0513;SPC WA N - 575,956.59 2,353,872.87 sFT 0.99996957 +2 11 35.6

TO0513;UTM 11 - 5,376,866.787 434,490.626 MT 0.99965272 -0 39 54.6

TO0513

TO0513! - Elev Factor x Scale Factor = Combined Factor

TO0513!SPC WA N - $0.99991359 \times 0.99996957 = 0.99988317$

TO0513!UTM 11 - $0.99991359 \times 0.99965272 = 0.99956634$

TO0513

TO0513 SUPERSEDED SURVEY CONTROL

TO0513

TO0513 NAD 83(2007)- 48 32 29.33414(N) 117 53 15.09591(W) AD(2007.00) 0

TO0513 ELLIP H (02/10/07) 551.403 (m) GP(2007.00)

TO0513 NAD 83(1998)- 48 32 29.33382(N) 117 53 15.09636(W) AD() A

TO0513 ELLIP H (03/21/00) 551.410 (m) GP() 3 2

TO0513 NAD 83(1991)- 48 32 29.33232(N) 117 53 15.09659(W) AD() B

TO0513 ELLIP H (05/29/91) 551.530 (m) GP() 4 1

TO0513 NAVD 88 (09/01/00) 568.94 (m) 1866.6 (f) LEVELING 3

TO0513 NAVD 88 (03/21/00) 569.0 (m) UNKNOWN model used GPS OBS

TO0513 NAVD 88 (11/01/99) 568.94 (m) 1866.6 (f) LEVELING 3



TO0513 NGVD 29 (??/??/92) 567.716 (m) 1862.58 (f) ADJ UNCH 1 2

TO0513 NGVD 29 (05/29/91) 567.72 (m) 1862.6 (f) LEVELING 3

TO0513

TO0513.Superseded values are not recommended for survey control.

TO0513

TO0513.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

TO0513.See file dsdata.txt to determine how the superseded data were derived.

TO0513

TO0513_U.S. NATIONAL GRID SPATIAL ADDRESS: 11UMP3449076866(NAD 83)

TO0513

TO0513_MARKER: DB = BENCH MARK DISK

TO0513_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT

TO0513_SP_SET: CONCRETE POST

TO0513_STAMPING: Z 264 1944

TO0513_MARK LOGO: CGS

TO0513_PROJECTION: FLUSH

TO0513_MAGNETIC: N = NO MAGNETIC MATERIAL

TO0513_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO

TO0513+STABILITY: SURFACE MOTION

TO0513_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

TO0513+SATELLITE: SATELLITE OBSERVATIONS - August 18, 2009

TO0513

TO0513 HISTORY - Date Condition Report By

TO0513 HISTORY - 1944 MONUMENTED CGS

TO0513 HISTORY - 1951 GOOD USGS

TO0513 HISTORY - 19891130 GOOD NGS

TO0513 HISTORY - 19900831 GOOD

TO0513 HISTORY - 19980224 GOOD WADNR

TO0513 HISTORY - 19990816 GOOD NGS

TO0513 HISTORY - 20061214 GOOD WADT

TO0513 HISTORY - 20090818 GOOD WHPACI

TO0513

TO0513 STATION DESCRIPTION

TO0513

TO0513'DESCRIBED BY COAST AND GEODETIC SURVEY 1944

TO0513'2.1 MI E FROM COLVILLE.

TO0513'ABOUT 2.1 MILES EAST ALONG ROADS FROM THE STATION AT COLVILLE, AT THE

TO0513'SOUTH SIDE OF COLVILLE AIRPORT, AT THE SOUTHWEST CORNER OF THE TO0513'NORTH-SOUTH RUNWAY, 1.5 FEET EAST OF A REFERENCE POST AND SET FLUSH

TO0513'WITH THE GROUND.

TO0513

TO0513 STATION RECOVERY (1951)

TO0513

TO0513'RECOVERY NOTE BY US GEOLOGICAL SURVEY 1951

TO0513'DESCRIBED AS FOLLOWS--2.1 MI E. OF COLVILLE. AT SOUTH SIDE OF



TO0513'COLVILLE AIRPORT, AT SOUTHWEST CORNER OF NORTH AND SOUTH RUNWAY, 1.5
TO0513'FT E. OF WHITE WOODEN WITNESS POST. IN TOP OF CONCRETE POST
FLUSH
TO0513'WITH GROUND NGS DISK STAMPED---Z 264 1944---.
TO0513'NEW LOCATED FOLLOWS--LOCATED AT WEST END OF E.-W. TAXI STRIP OF
TO0513'COLVILLE AIRPORT.
TO0513'STATION MARK--NGS TABLET STAMPED---Z 264 1944---, SET IN CONCRETE
POST
TO0513'PROJECTING 4 INCHES ABOVE GROUND.
TO0513
TO0513 STATION RECOVERY (1989)
TO0513
TO0513'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1989
TO0513'THE STATION IS LOCATED ABOUT 40.2 KM (25.0 MI) SOUTHWEST OF TIGER,
TO0513'35.4 KM (22.0 MI) NORTHWEST OF CHEWELAH, 35.4 KM (22.0 MI) NORTHEAST
TO0513'OF INCHELIUM AND AT THE AIRPORT AT COLVILLE IN SECTION 10, T35N,
TO0513'R39E.
TO0513'TO REACH FROM THE POST OFFICE AT THE INTERSECTION OF OAK STREET
AND
TO0513'ASTOR STREET IN COLVILLE, GO NORTH ON OAK STREET FOR 0.32 KM
TO0513'(0.20 MI) TO THE INTERSECTION OF THIRD STREET, STATE HIGHWAY 20 .TURN
TO0513'RIGHT AND GO EAST ON THIRD STREET FOR 1.77 KM (1.10 MI) TO THE CREST
TO0513'OF THE HILL, AN OFF SET CROSS ROAD AND THE ENTRANCE TO THE
AIRPORT.
TO0513'TURN RIGHT AND GO SOUTH FOR 0.16 KM (0.10 MI) TO THE TAXIWAY. TURN
TO0513'RIGHT AND GO SOUTHWEST ON THE TAXIWAY FOR 0.64 KM (0.40 MI) TO THE
TO0513'END OF THE RUNWAY AND THE STATION.
TO0513'THE MARK IS SET IN THE TOP OF A ROUND CONCRETE MONUMENT THAT IS
FLUSH
TO0513'WITH THE GROUND SURFACE. IT IS 15.1 M (49.5 FT) SOUTHWEST OF THE
TO0513'SOUTHWEST END OF THE TAXIWAY, 2.5 M (8.2 FT) SOUTH OF A WHITE
TO0513'CARSONITE POST, 2.2 M (7.2 FT) EAST OF A WHITE CARSONITE POST, 2.0 M
TO0513'(6.6 FT) NORTH OF A WHITE CARSONITE POST, 1.5 M (4.9 FT) WEST OF A
TO0513'WHITE CARSONITE POST AND 0.47 M (1.54 FT) NORTH OF A WITNESS POST.
TO0513
TO0513 STATION RECOVERY (1990)
TO0513
TO0513'RECOVERED 1990
TO0513'RECOVERED IN GOOD CONDITION.
TO0513
TO0513 STATION RECOVERY (1998)
TO0513
TO0513'RECOVERY NOTE BY WA DEPT OF NAT RES 1998 (FP)
TO0513'THE STATION IS LOCATED ABOUT 40.2 KM (24.95 MI) SOUTHWEST OF TIGER,
TO0513'35.4 KM (22.00 MI) NORTHWEST OF CHEWELAH, 35.4 KM (22.00 MI) NORTHEAST
TO0513'OF INCHELIUM AND AT THE AIRPORT AT COLVILLE IN SECTION 10, T35N, R39E.



TO0513'TO REACH FROM THE POST OFFICE AT THE INTERSECTION OF OAK STREET AND
TO0513'ASTOR STREET IN COLVILLE, GO NORTH ON OAK STREET FOR 0.32 KM (0.20 MI)
TO0513'TO THE INTERSECTION WITH THIRD STREET, STATE HIGHWAY 20. TURN RIGHT
TO0513'AND GO EAST ON THIRD STREET FOR 1.77 KM (1.10 MI) TO THE CREST OF THE
TO0513'HILL, AN OFF SET CROSS ROAD AND THE ENTRANCE TO THE AIRPORT. TURN
TO0513'RIGHT AND GO SOUTH FOR 0.16 KM (0.10 MI) TO THE TAXIWAY. TURN RIGHT
TO0513'AND GO SOUTHWEST ON THE TAXIWAY FOR 0.64 KM (0.40 MI) TO THE END OF
TO0513'THE RUNWAY AND THE STATION. THE MARK IS SET IN THE TOP OF AN 8 INCH
TO0513'SQUARE CONCRETE MONUMENT THAT IS FLUSH WITH THE GROUND SURFACE. IT IS
TO0513'15.1 M (49.5 FT) SOUTHWEST OF THE SOUTHWEST END OF THE TAXIWAY, 12.0 M
TO0513'(39.4 FT) NORTHEAST OF CHAINLINK FENCE CORNER, 2.2 M (7.2 FT) EAST OF
TO0513'A WHITE CARSONITE POST, 1.5 M (4.9 FT) WEST OF A WHITE CARSONITE
POST
TO0513'AND 0.4 M (1.3 FT) NORTH OF A WITNESS POST.

TO0513
TO0513 STATION RECOVERY (1999)
TO0513
TO0513'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1999 (CSM)
TO0513'RECOVERED AS DESCRIBED.

TO0513
TO0513 STATION RECOVERY (2006)
TO0513
TO0513'RECOVERY NOTE BY WA DEPT OF TRANSP 2006 (JG)
TO0513'RECOVERED AS DESCRIBED IN GOOD CONDITION.

TO0513
TO0513 STATION RECOVERY (2009)
TO0513
TO0513'RECOVERY NOTE BY W + H PACIFIC, INCORPORATED 2009 (WHP)
TO0513'RECOVERED AS DESCRIBED IN GOOD CONDITION.

*** retrieval complete.
Elapsed Time = 00:00:02



Appendix C: Field Notes

15137 Colville NF				
Unit:	R2	B2	Topcon1	Topcon2
Date:	7/8/15	7/8/15	7/8/15	7/8/15
Coll Type:	Static	Static	VRS	Static
Ant Type:	Leica	Leica	Topcon	Topcon
Ant Ht:	1.219m	1.005m	2.0m	2.0m
Offset:	0.36	0.36	0	0
ARP:	1.579	1.365	2.0m	2.0m
Start:	13:23	14:47	NA	17:19
Stop:	05:17	04:42	NA	17:54
Point:	SET2	K24	CHK01	CHK01

A#6	UB01	GCP19	21	OT04	GCP21
7	HG01	GCP19	22	BR04	GCP21
8	UB02	GCP20	23	HG04	GCP26
9	BR01	GCP26	24	CNTR08	
10	OT01	GCP20	25	UB06	GCP33
11	HG02	GCP21	26	OT05	GCP33
12	OT02	GCP22			
13	OT03	GCP22			
14	HG03	GCP22			
15	TR01	GCP22			
16	BR02	GCP22			
17	BR03	GCP23			
18	UB03	GCP23			
19	UB04	GCP24			
20	UB05	GCP25			

Date: 7/8/15
 CHECK B: CHK01
 A# 001-005

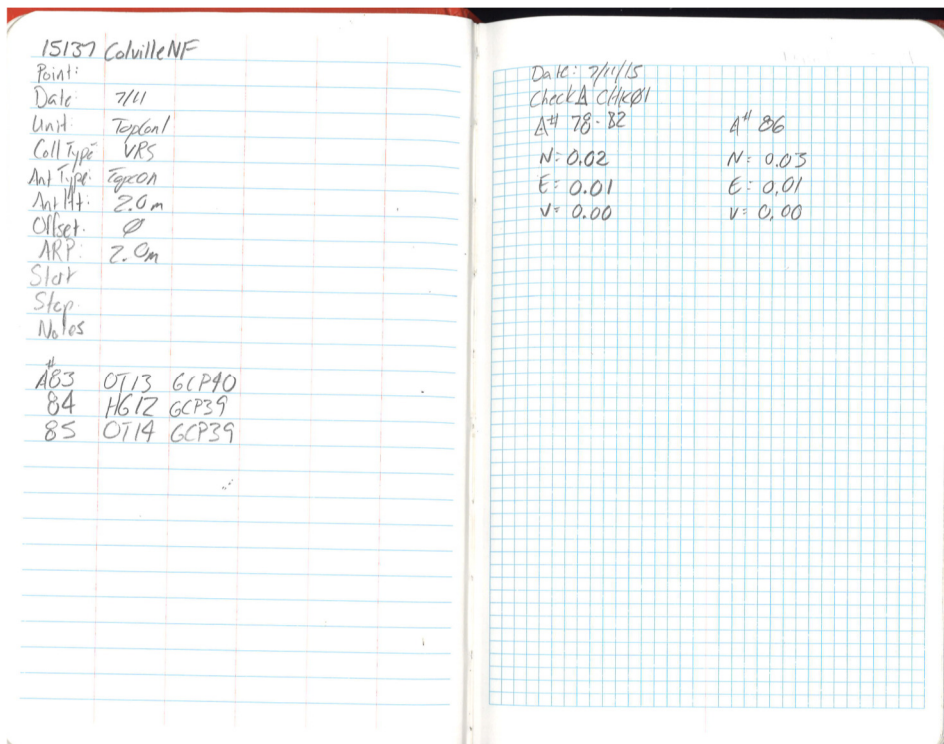
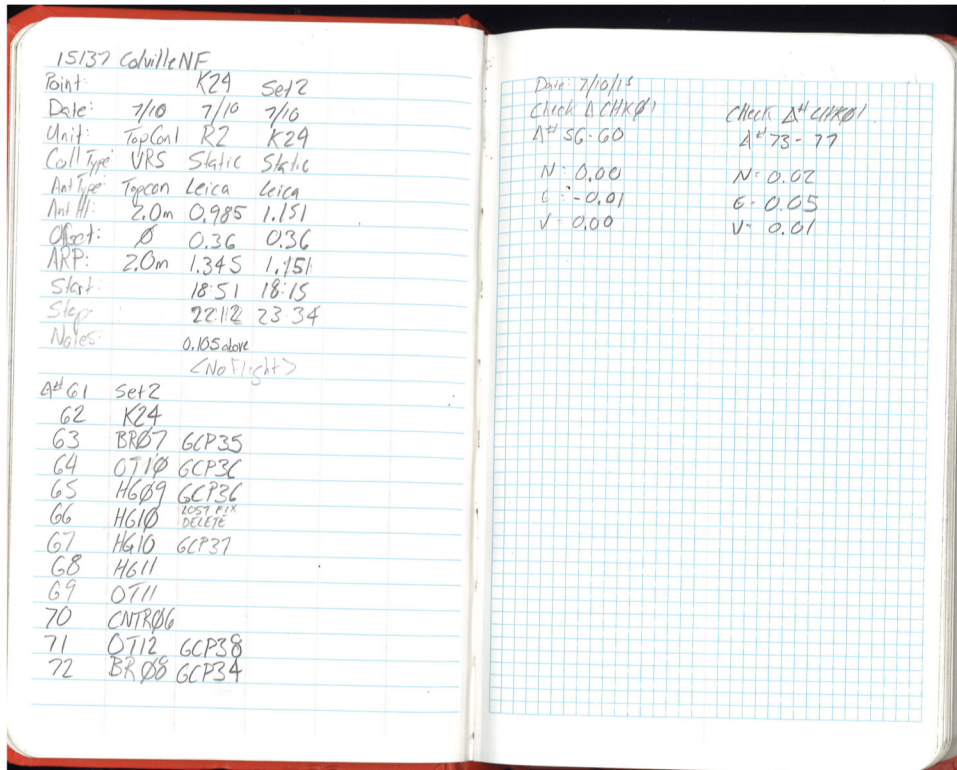
N=	A# 027-031
E=	N=
V=	E=
	V=

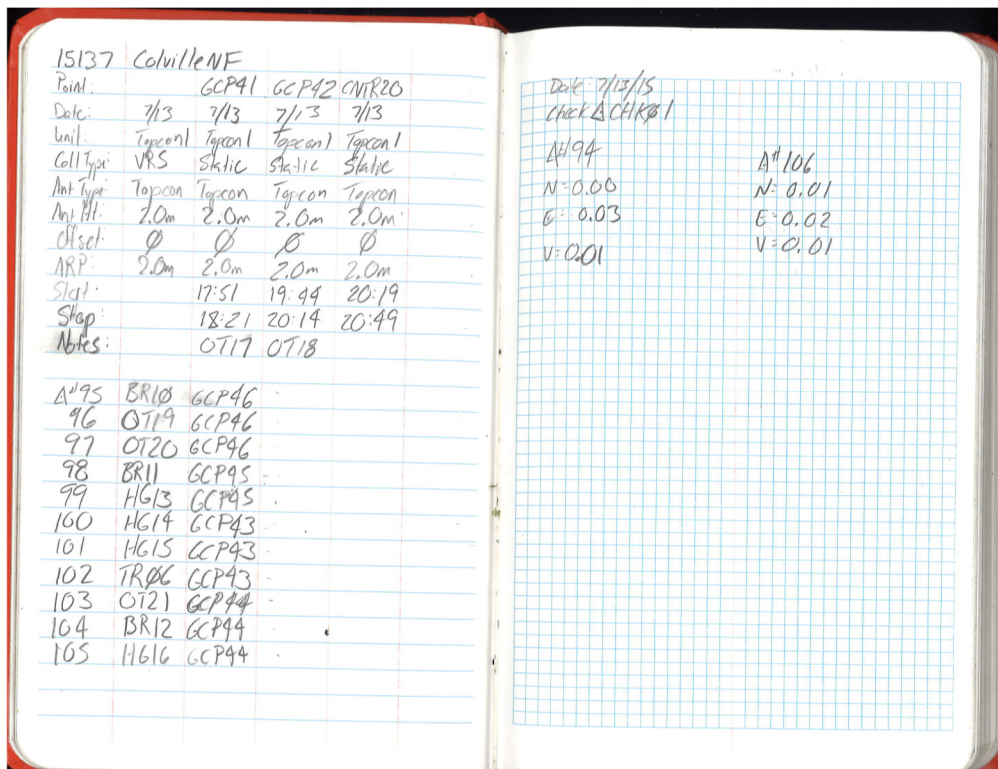
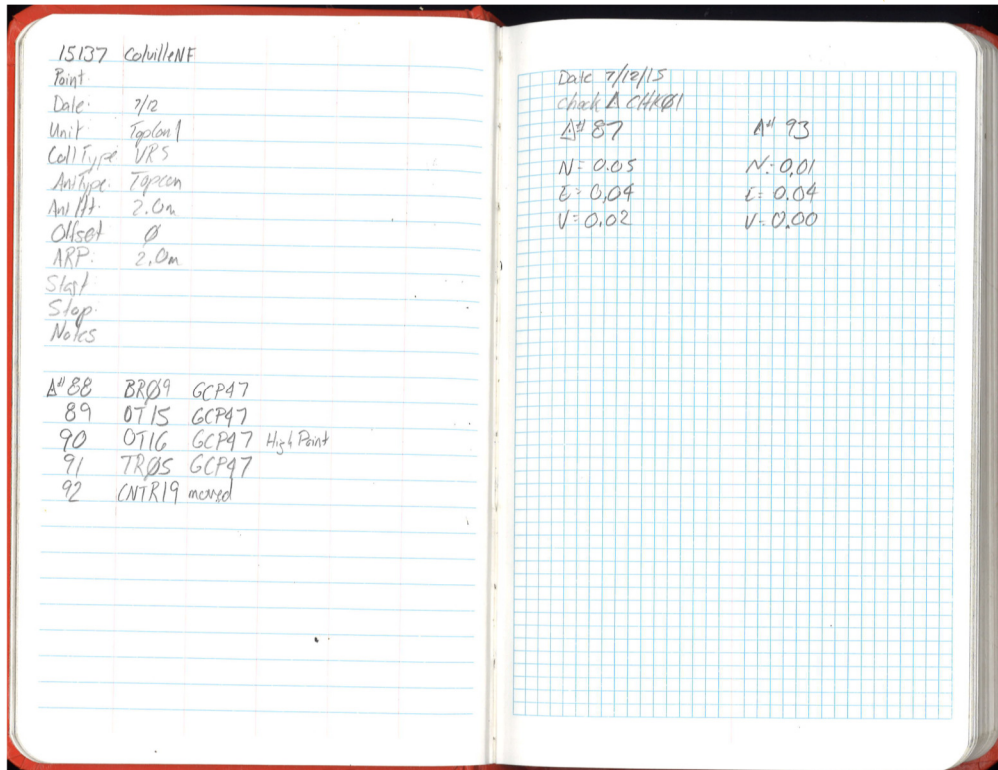
15137 Colville NF				
Point:	SET2	K24		
Date:	7/9	7/9	7/9	
Unit:	R2	B2	Topcon1	
Coll Type:	Static	Static	VRS	
Ant Type:	Leica	Leica	Topcon	
Ant Ht:	1.219	0.986	2.0m	
Offset:	0.36	0.36	0	
ARP:	1.579	1.346	2.0m	
Start:	12:25	12:41		
Stop:	23:23	21:17		
Notes:				

A# 37	CNTR01			
38	HG05	GCP27		
39	TR02	GCP27		
40	BR05	GCP27		
41	OT06	GCP28		
42	HG06	GCP28		
43	TR03	GCP28		
44	OT07	GCP29		
45	BR06	GCP29		
46	HG07	GCP30		
47	HG08	GCP31		
48	OT08	GCP31		
49	OT09	GCP32		
50	TR04	GCP32		

Date: 7/9/15
 Check A: CHK01
 A# 32-36

N = +0.03	N = -0.02
E = -0.02	E = -0.06
V = 0.01	V = 0.00





15137 Colville NF				
Point:	GCP98	GCP99	GCP70	
Date:	7/14	7/14	7/14	7/14
Unit:	Topcon	Topcon	Topcon	Topcon
Coll Type:	VRS	Static	Static	Static
Ant Type:	Topcon	Topcon	Topcon	Topcon
Ant Ht:	2.0m	2.0m	2.0m	2.0m
Chisel:	Ø	Ø	Ø	Ø
ARP:	2.0m	2.0m	2.0m	2.0m
Start:		20:41	22:21	01:14
Stop:		21:11	22:51	01:44
Notes:	BR13	H617	BR14	
AN 108 CNTRØ9 SINGLE BASE 2 INCH LEAVES 109 0722 GCP71 110 BR15 GCP71 111 TRØ7 GCP71 112 H618 GCP71				

Date: 7/14/15
 Check: CHK01
 AN 107
 N = 0.02
 E = 0.01
 V = 0.01
 AN 113
 N = 0.03
 E = 0.02
 V = 0.01

15137 Colville NF				
Point:	K29	SET2	GCPØ4	GCPØ9
Date:	7/15	7/15	7/15	7/15
Unit:	R3	R2	Topcon	Topcon
Coll Type:	ABGPS	ABGPS	VRS	Static
Ant Type:	Leica	Leica	Topcon	Topcon
Ant Ht:	0.992	1.241	2.0m	2.0m
Chisel:	0.36	0.36	Ø	Ø
ARP:	1.352	1.601	2.0m	2.0m
Start:	16:15	18:07	23:24	00:23
Stop:	No Flight	No Flight	23:54	00:53
Notes:	0.105 above		H619	BR16

Date: 7/15/15
 Check: ACNEØ1
 AN 114
 N = 0.02
 E = 0.05
 V = 0.01

15137 Colville NF			
Point:	SET2	K24	
Date:	7/16	7/16	7/16
Unit:	Topcon 1	R2	R3
Coll Type:	VRS	ABGPS	ABGPS
Ant Type:	Topcon	Leica	Leica
Ant Ht:	2.0m	1.241	0.984
Offset:	0	0.36	0.36
ARP:	2.0m	1.601	1.344
Start:		21:00	22:36
Stop:		08:09	0:57
Notes:			0.105chute

116	HG20	GCP13
117	CNTR05	
118	BR17	GCP13
119	BR18	GCP13
120	TR08	GCP13
121	OT23	GCP13
122	TR09	GCP13
123	OT24	GCP12
124	HG21	GCP12
125	BR19	GCP12
126	TR16	GCP12
127	TR11	GCP12
128	BR20	GCP12
129	CNTR04	SINGLE BEAC LINE GCP13

Date: 7/16/15
 Check A: CHK01
 Ant 115 Ant 130
 N: 0.03 N: 0.03
 E: 0.01 E: 0.05
 V: 0.02 V: 0.02

15137 Colville NF					
Point:	SET2	K24	SET2	K29	SET3
Date:	7/17	7/17	7/17	7/17	7/17
Unit:	R2	R3	R2	R3	T1
Coll Type:	ABGPS	ABGPS	ABGPS	ABGPS	ABGPS
Ant Type:	Leica	Leica	Leica	Leica	Topcon
Ant Ht:	1.241	0.984	1.241	0.984	2.0m
Offset:	0.36	0.36	0.36	0.36	0m
ARP:	1.601	1.344	1.601	1.344	2.0m
Start:	10:59	11:56	20:29	22:10	23:41
Stop:	20:16	18:39	08:20	23:45	05:44
Notes:		0.105chute		0.105chute	Dual Buttons Comerider

Date: 7/17
 No VRS Collection

15137 Colville NF

Point: 2264 SET1

Date: 7/18 7/18 7/18

Unit: R3 R2 T1

Coll Type: ABGPS ABGPS VRS

Ant Type: Ceica Ceica Topcon

Ant Ht: 1.191 1.185 2.0m

ChSet: 0.36 0.36 0m

ARR: 1.551 1.545 2.6m

Start: 16:07 17:10

Stop: 1:41 04:03

Notes: *word markings check in at project
can not achieve fix for evening check in

A#132	OT25	GCP08	A#146	HG25	GCP01
133	BR21	GCP08		<small>SINGLE BASE LINE RPTS</small>	
134	HG22	GCP08	147	TR13	GCP01
135	TR12	GCP08		<small>SINGLE BASE LINE RPTS</small>	
136	CNT802		148	HG26	GCP02
137	HG23		149	HG27	GCP02
138	BR22		150	BR24	GCP02
139	BR23		151	HG28	GCP03
140	HG24		152	BR25	GCP03
141	OT26	GCP07	153	TR14	GCP03
142	OT27	GCP07	154	OT31	GCP03
143	OT28	GCP07	A#151-154	<small>SINGLE BASE LINE RPTS</small>	
144	OT29	GCP07			
145	OT30	GCP07			

Date: 7/18/15

check A: CHK01

A#131

N: 0.03

E: 0.04

V: 0.21

*can't set
position fix??*

15137 Colville NF

Point: SET2 G483 SET2 GCP26

Date: 7/19 7/19 7/19 7/19

Unit: T1 R2 T1 R3

Coll Type: ABGPS ABGPS ABGPS Static

Ant Type: Topcon Ceica Topcon Ceica

Ant Ht: 2.0m 1.421 2.0m 1.115

ChSet: 0.36 0.36 0m 0.36

ARR: 2.0m 1.781 2.0m 1.475

Start: 10:50 11:36 21:36 02:23

Stop: 20:18 23:42 04:23 02:53

Notes: 10m below No Flight HG29

Date: 7/19

No VRS Collection



Appendix D: Photographs





























Z264 1 2015JULY18



Z264 2 2015JULY18





K24_3S_2015JULY08



K24_3W_2015JULY08



K24_1_2015JULY08



K24_2_2015JULY08





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